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RESEARCH ON CORPORATE ENVIRONMENTAL RESPONSIBILITY IN CHINA

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CONTENTS

Foreword

This book aims to discuss the importance of corporate environmental responsibility (CER), and strive to answer these questions: How to view the development of CER in China? How to determine the key work of current CER? How to use the Internet to release environmental information and enable the public to play an active role in participation? If you are reading this preface, you are likely to be the manager, responsible for social relations, public affairs, environmental management of a company; Or perhaps you are a government official, concerned with the implementation and improvement of environmental policies; Or perhaps you are a business school teacher or student, thinking about corporate social responsibility (CSR) in the relevant courses. In this book, you will perceive the spark of thoughts and the perspective of philosophy.

The author has been engaged in the research of CSR and environmental management for more than ten years. Successively, she participated in the 2005 Conference on Environmental Economic Research Center of Fudan University, 2006 Management Case Conference in Renmin University of China, 2008 Chinese and the United States Scholars conference on Management Science and Engineering in Shanghai Jiaotong University, 2008 CSR International Conference in University of Durham UK, 11th Biennial 2010 Conference of the International Society of the Ecological Economics in the University of Oldenburg and Breman in Germany, and 2012 CSR International Conference in Lahti Finland. Gradually, she has a unique insight in the research of CER.

You can learn different aspects from this book. From the research content, the book mainly discusses the theoretical foundation and developing evolution of CSR, the elements, structure and function of CER, CER in developed countries, CER in China, China's corporate environmental pollution and responsibility analysis, the systematic and scientific analysis of CER and the suggestions for China's CER improvement; From the research perspective, the system and dialectical perspective is different from the previous economic, social and ethical angles. Based on its views of system, time and space, and progress, CSR is studied in a more complete and dynamical way; From the main stakeholders, this research focuses on the collaborative interaction among enterprises, government and the public. It will help to guide the business managers, government officials and other stakeholders to regulate their environmental behaviors.

Currently, scholars all over the world are concerned about the various phenomena and problems in the development of China and Chinese enterprises. This book is a valuable academic achievement by Chinese scholar in CSR. I hope that the publication of this book will enhance the research level of Chinese scholars in CSR and CER, and the growth of the new generation of Chinese scholars as well. And I believe that the publication of this book will promote the international exchange of Chinese management science research and extend the international influence of Chinese scholars.

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Preface

"Lucid waters and lush mountains are invaluable assets." This is the statement of Xi Jinping, General Secretary of Chinese Communist Party, which has been accepted by increasing audience nationally and internationally. Conforming with the statement, this book aims to show that environment is like water, development is like ship; the water can carry the ship and it can also upset it. This book will discuss the foundation, evolution and beautiful blueprint of Chinese enterprise sustainable development. It will build China's academic support of the scientific statement.

It is a unique perspective to study corporate environmental responsibility from systematic and dialectical science angle, which is different from the perspectives of economics, sociology and management. This helps the government support environmental protection, enterprises fulfill their responsibilities, and the public raise environmental awareness. I believe that this kind of Chinese philosophical thinking can contribute to academic research in corporate social responsibility.

The empirical research in this book is concrete and practical. The questionnaire investigation and performance of the environmental responsibility of 30 heterogeneous enterprises were analyzed, and the ranking of 30 enterprises was obtained, and an important reference for the evaluation index of the enterprise environmental responsibility was put forward. Therefore, this book will be useful for the enterprise managers and government officials as well.

With the development of climate change, the deterioration of environmental crisis and the establishment of ecological civilization, the environmental responsibility of enterprises becomes an increasingly urgent hot issue. Enterprises will benefit the sustainable development of human society by reducing resource consumption and waste discharge, while maintaining economic growth. There is no doubt that the research on corporate environmental responsibility is of great practical significance.

CONSENT FOR PUBLICATION

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CONFLICT OF INTEREST

The author confirms that this eBook contents have no conflict of interest.

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CHAPTER 1

Introduction

Abstract: The global environmental crisis has caused growing attention worldwide. The hot issue of climate change is one of the most serious issues. "Research on CER in China" is of great importance for the enterprises to maintain sustainable development for the government to control environmental deterioration and for the public to attend harmonious society. System and Dialectical Science (SDS) is the perspective of this research. With the basic views of systematic point, progressive point and time and space point, and the basic rules of the organization emerging-law and difference cooperating law help us study Corporate Environmental Responsibility (CER) in a more comprehensive and dynamic manner. There are 10 chapters in this book. Based on the literature review, this research tries to analyze the element, structure and function of CER in China. After the in-depth discussion of environmental pollution and responsibility in China, it focuses on the systematic method and makes empirical analysis of CER in 30 Chinese enterprises. Finally, it puts forward the suggestions for CER improvement in China. The research methodology includes historical analysis, comparative analysis and empirical analysis. The questionnaire investigation and environmental performance of 30 heterogeneous enterprises have been analyzed, the ranking of 30 enterprises was obtained and an important reference for the evaluation index of the enterprise environmental responsibility was put forward. To establish the trinity of government, business and the public set up, collaboration will be the countermeasure. As an essential aspect of Corporate Social Responsibility (CSR), CER is expected to make further improvement in the future.

Keywords: China, Corporate Environmental Responsibility (CER), Corporate Social Responsibility (CSR), Environment, Sustainable development, System and Dialectical Science (SDS).

Corporate Social Responsibility (CSR) is an important issue which the western academia began to discuss in the early 20th century. The high academic value and practical significance have been widely recognized. Corporate Environmental Responsibility (CER), an increasingly urgent topic in CSR, has become the common focus of attention from subjects of management science, economics, sociology and law.

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1. RESEARCH BACKGROUND AND SIGNIFICANCE

During late 19th century and early 20th century, the social attention for the enterprises was continuously raised by the ever expanding corporate force, industry development and social negative influence. Recently, with the world organization advocate, the notion that enterprises should undertake necessary responsibilities has begun to be emphasized by government and academic field. It gradually has become an important notion of corporate governance and strategic management. One consensus is that corporate sector can undertake certain social responsibility to expand and revise the traditional enterprise target to pursue maximum profit and shareholder welfare. It also helps to construct harmonious relationship with various stakeholders and raise integrate benefit of the whole society. From the specific perspective of environmental aspect of CSR, this book intends to extend the progress of CSR research and attract more valuable viewpoints.

The process of industrialization and modernization has caused serious environmental problems. The global environmental crisis, such as sudden environmental pollution and large scale environment damage, was caused by the imbalance of environment (Carson, 1962; Rifkin, 1991; Laszro, 1997; Maureen and Kane, 1998; Michael, 2000; Villiers, 2001; Greenspan, 2001). According to the statistics of *Chinese Youth Daily* on January 6th 2000, worldwide environmental hazards were successive since 1930s: the Belgium Mass Velley Smog Event in 1930; the Los Angeles Chemical Smog Event in 1943; the U.S. Dorola Smog Incident in 1930; the London Smog Event in 1952; the Japanese Minamata Incident during 1953-1956; the Japanese Bone Pain and Disease Event during 1955-1972; the Japanese Rice Bran Oil Event in 1968; the Indian Bhopal Event in 1984; the Chernobyl Nuclear Accident in 1986; the Swiss Rhine Toxic Pollution Incidents in 1986 and the Grazil Radioactive Leak Event in 1987 (http://grchina.com/gb/gbj/spot/spo01163.htm). The irresponsible behavior led to serious environmental damage and human beings also suffered from the environmental punishment.

On the environmental issue, the United Nations held three landmark conferences. In 1972, the Human and Environmental Conference was held in Stockholm, Sweden. This conference created important document “Action Plan for Human Environment”, issuing “Human Environment Declaration”, proposing that human being should not only explore and utilize nature but also take the responsibility and obligation to maintain nature. In 2002, the Environment and Development Conference was held in Brazil and 21st Century Agency and other important documents were passed. As per the requirement of the situation, the United Nations set up the Commission on Sustainable Development after this conference.

In 2002, the World Summit on Sustainable Development was held in South Africa. Representatives from 192 countries, including 104 heads of state and government leaders, attended the conference. Finally, two basic documents of "Implementation Plan" and "Political Declaration" were adopted. This influential U.N. General Assembly indicated humans to take a step forward again on the road of achieving sustainable development.

With the promotion of sustainable development concept, the setting off of environmental protection movement in the international arena, the support of government and the rising environmental awareness of the public, environmental protection has become a social initiative to safeguard human survival and development.

Although there is a lot of controversy on the issue of CSR in the western countries, views on CER are more consistent. Companies have brought CER into practice and specify relevant standards and specifications. On the World Economics Forum in Davos, Switzerland in January 1999, the United Nations Secretary General Kofi Annan proposed a "UN Global Compact", which was officially launched at Union Nations Headquarters in July 2000. The compact calls for companies to comply with social responsibility which includes environmental protection. On December 12th 2001, Social Accountability International (SAI) published the first revision of SA8000 standard, namely SA8000:2001. The standards involved CER.

2. RESEARCH PERSPECTIVE AND INNOVATION

To study CER from the views of System and Dialectical Science (SDS) is the perspective of this book. With the achievement of new theories and modern science, SDS is a science of philosophy based on Marxism. SDS aims to explain the dialectical development law of systematic world in a scientific way. Deeply and completely, it discovers the features and links of the nature, human society, systematic movement of thinking field; it examines the life-cycle progress of system and the dialectical relations both in and out of system.

As Hegel (1957), a famous German philosopher, pointed out, "The element of truth is concept; the virtual state of truth is scientific system." More specifically, Qian Xueseng (1987), a well-known Chinese space scientist said "System is regarded as a fairly complicated research subject, that is the organic unity combined with several components, interacting and interdependent with each other, and this functional system itself is affiliated to a bigger system" (Wu, 2003). Consequently, CER is a complicated system, which is affiliated to CSR system and is one of its important components. As an open system, the enterprise exchanges with the outer environment. It should firstly get the investment of

human resource, capital, materials, technology, information, *etc.* from the outer environment and then through the transferring system within the enterprise; the investment is changed into product, labor and reward. When the output leaves the enterprise system, the exchanging progress is finished. Therefore, the living environment is essential to enterprise development. While making fine product and increasing benefit, one main task that CSR should take into account is to conduct clean manufacturing and reduce pollution. As Dow Jones analyst puts it, those companies who enjoy highest capital reward, also perform better than their rivals in pollution governance and resource control; those who consider the society and their environmental influence hold superior stock achievement than others. Undoubtedly, it is the combination of wealth and environmental responsibility that enables modern enterprise, the open system, to develop continuously.

The basic SDS views are systematic point, progressive point, and time and space point. The fundamental laws of SDS refer to organization-emerging law, difference cooperating law, structural and functional law, class transferring law and integrity improving law. These views and laws explore the interconnected system, the general nature of interaction and reveal the development of internal source, fundamental driving force, basic state and general trend of the material world, which is of important theoretical significance to the CER research.

Systematic point explains that the system is the basic way and essential attribute of the material world, and the world itself is the material world of system. Systematic point focuses on the systematic nature of the material world and mainly discovers the systematic link, existence, movement and development horizontally. Progressive point refers to the systematic feature of world development, the present progress and the development trend. Vertically, the progressive point discovers the dynamic progress of the world system. Time and space point means the existing state, relationship and development of systemic world. One-dimensional time and multi-dimensional space also show their systematic nature. The above three points are interdependent on each other. Among them, systemic point is commanding and takes the leading role (Wujie, 2003:38, 39).

Based on the above view points, we can use SDS to analyze CSR.

Firstly, in the systematic point of view, CSR is composed of three core factors—element, structure and function. The elements are the subjects of CSR, such as shareholders, employees, customers, commercial partners, community and environment. As for shareholders, the basic responsibility of the enterprise is to respect their rights regulated by law, keep balance between the capital safety and

benefit of them and provide them with true information of operation and investment, such as financial report and company annual meeting. As for employees, the enterprise should provide safe and healthy working environment first, then fair job opportunities, promotion opportunities and education opportunities, and finally, the opportunities of democratic participation and self-management. As for customers, enterprises should offer safe and reliable product and respect customers' right to know and to choose. As for commercial partners, enterprises can use the contract to compete justly. In community, enterprises should participate in local constructions. In order to be the "social citizen", the enterprises may take advantage of the product and technology to support the educational cause, employ the jobless and help the homeless. As for the natural environment, the CER is essential. Guided by the green value, the enterprises should strengthen the green role awareness, apply green management and advocate green manufacturing and consuming. The green value is the new notion which aims at the harmony between man and nature, calling for respecting and protecting nature and refusing any opposite attitude and behavior. To cultivate green role awareness means that enterprises should hold an equal attitude towards environmental responsibility and benefit accountability. When enterprises make investing and publicizing plan, the negative influence of environment should be taken into consideration. Thus, the technological process may be altered in order to raise technical content and reduce the pollution index. Financial department should design effective evaluation system and calculate the potential cost of destructing the environment. Sales department should advocate the green consuming concept and lead customers on the way of proper, healthy, safe and economical consuming. In the work of green audit, enterprises should be strict with themselves in disciplining, monitoring and examining.

CSR refers to the economic, law abiding, ethical and beneficent expectation by certain society for the enterprises (Carroll, 1991). Among this, the economic responsibility involves not only the maximum profit but also the expansions, such as the productivity improvement, shareholder's wealth maintaining and increasing, more employment, fair payment and social welfare, therefore, it has the function of efficiency improvement and fairness consideration. The law-abiding responsibility is to legally maintain the basic social order with the lowest ethic standard. Therefore, it is the compulsory restriction of responsible undertaking. The ethical responsibility of enterprise refers to other social expectations which haven't become law *i.e.* the self-discipline, or the internal, voluntary and active responsibility alternative. The kind of "soft restriction" is helpful to advocate social standard. Beneficent responsibility means that enterprises conduct additional activities according to some decided value and social expectation, such as supporting community project and beneficent causes. Such volunteer donation can effectively improve social welfare.

Secondly, progressive point of SDS, CSR appears to be a dynamic process with the development of enterprise life-cycle. As an individual in the social economic activities, enterprise has its own life duration. Fig. (**1.1**) shows that the scope and emphasis of CSR are ever adjusting with the life progress of enterprise.

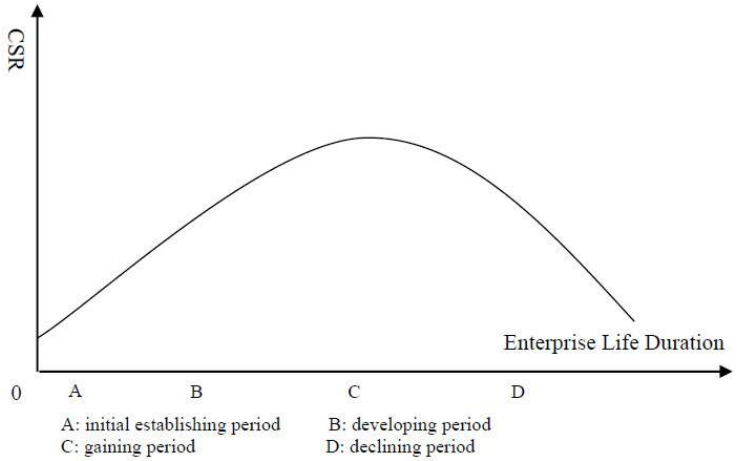

Fig. (1.1). Social responsibility and enterprise life duration.

During the initial establishing period, CSR is focused on survival. Managers participate in economic activities of minimizing cost and maximizing profit to raise the investors benefit and gain more space for growing. During the developing period, the emphasis of CSR is on the interest of employees and customers. Apart from the investors' interest, managers strive for human resources management and link the enterprise development with employee improvement. With the continuous rising status in the profession and product sharing in the market, the cash flow and profit tend to be stable. The enterprises then begin to be customer-oriented, take part in the fair play in market, respect and maintain customer's rights and interests, and provide fine quality commodity and service at the most affordable price. During the gaining period when enterprise scope expands greatly, CSR aims at public welfare. Managers actively pursue social justice and beneficent cause by helping the weak. As for protecting the environment, enterprises make a comprehensive use of resources and maintain ecological balance. During the declining period, enterprises are likely to fade from the market competition because of various reasons. Therefore, enterprise development is the base to shoulder CSR (Tian Hong, 2006:49, 50).

Finally, in the time and space view of SDS, the social expectation and requirement for the contemporary enterprises are different due to various social systems. Thus, the focus and scope of CSR are different with obvious national and

epoch features. From the initial period of maximizing shareholders' interest, to the responsibility for employees, for the community and for natural environment, the enterprises experience an ever rising progress with more profit and stronger capability to reward the society. The improvement promotes enterprises development from the newly emerging state to the continuously gaining mature state. Different history, culture and economic conditions are accountable for different values and systems. Thus, it causes different policy constraints of CSR treatment. Based on this point of view, this book focuses on the environmental aspect of Chinese enterprises.

The fundamental laws of SDS refer to organization-emerging law, difference coordinating law, structural and functional law, class transferring law and integrity-improving law. The organization-emerging law discovers that structure and function have the instinct and tendency of systematic self improvement and self creation in orderly evolution; the difference coordinating law thinks that in the integrity, all kinds of differences between systems, between system and elements, and between elements and structures appear to be in perfect coordination. This is a result of cooperation of sub-systems and elements within the system at the target of systematic integrity; The structural and functional law points out that consuming structure exists in open system and through the exchange of materials, energy and information with the outside, the structure of system will be more dynamic and superior; The class transferring law clarifies that the systematic world always moves in the way of class transferring: from lower level to higher level, and different from the inferior class, the superior class involves the basic difference. This makes difference coordination of systematic integrity; the integrity improving law shows the tendency and direction of systematic movement with the internal elements interaction. All of these laws lead us to have an insight of CER.

CER is the subordinate system of CSR. It is the responsibility of enterprises to take steps in certain progress when the public requires strongly, the government advocates greatly and the enterprises develop continuously for better natural environment. Although the degree varies in different areas because of different political, economic and cultural conditions, CER turns out to be a healthy, stable and sustainable tendency (as Fig. **1.2** shows). This also embodies a more superior spirit of the enterprises, from its resources and for the society. At this stage, beyond the economical and law boundaries, enterprises can ethically take shareholders requirement into consideration and responsibly improve further environmental protection.

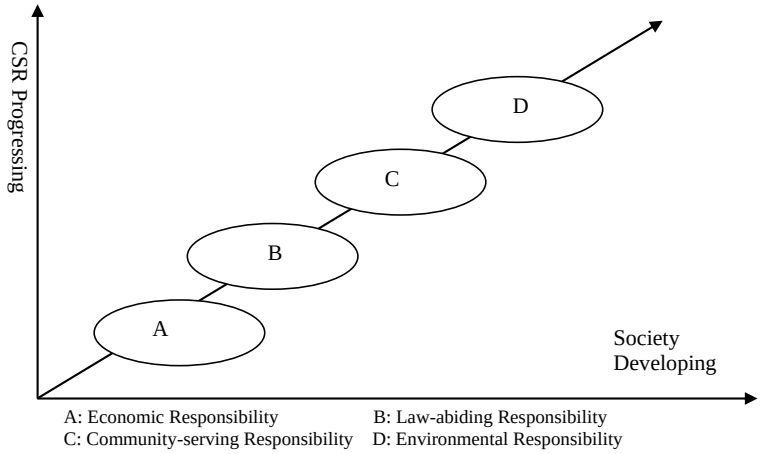

Fig. (1.2). Sustainable improvement of CSR.

The literature on CSR is vast, and study of CER from the SDS perspective is the innovation of this book. From the view of Carroll, Professor of U.S. Georgia University, CSR refers to specific expectations of companies to take economic, legal, ethical and philanthropic responsibilities. Study from the economic, social, legal or ethical perspectives can not cover the above four expectations, however, SDS can meet this requirement. This is decided by the characteristic SDS views of the system, time and space and progress. By the functions of organization-emerging law, difference cooperating law, structural and functional law, class transferring law and integrity improving law, the philosophy of SDS itself is making continuous progress and development, which will undoubtedly help us study CSR in a more comprehensive and dynamic manner This will be concluded in Chapter 10.

3. RESEARCH THINKING AND CONTENT

We start from the CER's parent generation system CSR and explore its emergence and development. The basic views and laws of SDS are adopted to analyze the current situation and deficiency of CER. We regard the enterprise as an open system, focusing on government-to-business support, business environmental culture construction, public supervision of business and effective three-party-interaction. We make appropriate reference of the advanced notion and practice from developed countries and put forward counter measures and suggestions for improving China's CER construction.

The details are as follows:

The first chapter discusses the research background and significance, perspective

and innovation, ideas and content, methods and expectations. The research background of CER is the emergence and development of CSR. The research starts from serious environmental problems at home and abroad, focusing on CER, with the aim to expand the CSR research progress and provide reference for sustainable use of our existing resources and economic sustainable development. To understand CER from the views of SDS is the perspective of this research. The basic views of SDS refer to systematic point, progressive point and time and space point. The fundamental laws of SDS are the organization emerging law, difference cooperating law, structural and functional law, class transferring law and integrity improving law. These views and laws describe the developing regulation of CER in a scientific way and disclose the essential characteristic of CER in a holistic manner. To explore CER from philosophical dimension of SDS is the perspective of this research. Different from previous perspectives of economics, sociology, ethics and law, it is helpful to study the developing process of CER and the dialectical relationship between the inside and outside system on the whole.

The second chapter discusses the origin, argument and development of CSR concept. Views of Bowen, Davis, McGuire, Walton, Carroll, Lee, Sethi, Eells and Walton, Preston and Post, Jones, Drucker, Wartick and Cochran, Epstein and Wood promoted the theoretical development of CSR, in which Carroll's research brought CSR in the systematic science view. Some international organizations, such as the United Nations Conference on Trade and Development, the World Business Council on Sustainable Development, Business for Social Responsibility and the International Chamber of Commerce, have higher demand for CSR and their research is more forward-looking from the developmental perspective. Chinese scholars Yu Xunda, Zhong Yong, Liu Cheng, Zhang Fan, Li Liqing, Chen Yongzheng, Hui Ning, Huo Li and Chen Yadong, respectively elaborate the connotation and denotation of CSR from the aspects of analysis perspective, concept definition, essence grasp and responsibility construction. Nowadays, CER occupies an important position in CSR. The related theories are sustainable development notion, social contract theory, legitimacy theory, stakeholder theory, circular economy theory and externality theory. To a large extent, Chinese scholars Zhu Dajian, Xiao Wei, Jia Lihong, Wu Jiaojun, *etc*. have consensus: the emergence and solution of environment issue closely related to business, government and the public. To clarify the environmental responsibility, establishing all entities involvement in binding mechanism is a wise policy of business and society sustainable development. Combing through the literature, this book argues that the enterprise evolution from the "economic man" to "social man" to "environmental man" is clearly visible. This is also the class transferring and function progressing law of SDS.

The third chapter is the CER analysis, which respectively explores the intrinsic properties of elements, structure, function and external links of government and society. In system perspective, the elements of CER include internal side and external side. The internal elements of CER refer to the resources, materials, staff, technology, products and waste. The external elements of CER refer to the investors, communities, business partners, governments, consumers and other stakeholders. These elements are composed of an important part of CER. According to the pyramid structure of CSR, CER can be classified into economic, legal, ethical and philanthropic levels, each of which has a unique function. Firstly, in the long term, corporate directly taking environmental responsibility can help reduce social cost and improve social resources allocation efficiency. Secondly, the legal nature of CER helps control the company external environmental cost. Thirdly, the ethical structure of CER helps establish the harmonious and fair relationship between human and nature. Finally, in the business cash funding of public welfare, donation or non-cash services, CER act of charity can improve the reputation and credibility of the local communities and have a positive real impact on social themes. Therefore, four levels of CER make progressive development from the basic level to advanced level, functions of CER will also continue to upgrade and expand.

The fourth chapter firstly discusses severe consequence of climate change and points out that the target of low carbon economy is to mitigate climate change. It then introduces different perspectives of low carbon economy and similar connotation as well. The pressures, opportunities and benefits of low carbon economy drive companies to practice environmental responsibility. The pressures originate from international policy, investor, national regulation, customers, peers, sub-sectors and supply chains. The opportunities and benefits refer to opportunities to develop corporate capabilities, benefits of early movement and advantages of brand effect. In the final part, it analyzes China's response to low carbon economy. China's current resource condition, high requirement for resources product and huge pressure of GHG emission reduction are elaborated, and main tasks of low carbon economy are proposed. As the emerging economy, China will take the responsibility to reduce carbon emission for sustainable development.

Chapter Five is the study of CER in advanced countries. Through some typical case analysis, the developed enterprise's self-discipline, public participation and government regulation in environmental management can be understood. Through a series of laws and measures, the German government achieved a changing pattern of economic development, industrial restructuring, production technology, energy efficiency upgrading and gradually solved the pollution problem in the process of industrialization. The learning and innovating spirit of Japanese

companies forms an outstanding corporate culture. From a negligible small business, Honda has developed into today's world-renowned multinational companies. It is inseparable from the responsible awareness and innovative spirit of its founder, Soichiro Honda. His company always imitates advanced technology which is practised by his leadership. However, their learning does not stop at imitation, but adds their own things, from imitation to creation, polishing their own talent with the acquired knowledge. So, the final products not only have the foreign product essence, but also maintain their integrity and traditional characteristics; The US Xerox implemented practical environmental control activities. Its environmental pilot project can be a good paradigm to take proactive measures rather than rely on government management. Xerox total quality management encourages full participation. Materials which meet environmental protection standards are chosen, waste is reduced, recycled products and equipment are used, package is improved and waste disposal responsibility is taken. Doing so increases prices, but reduces the amount of hazardous waste and chemical emissions. In some cases, it helps save the company's money. The experience of environmental governance in these countries has significant gaps with the developing countries as far as time and space are concerned. They have clear leading advantages in the level of development. On one hand, they set up the reference target for the newcomers. On the other hand, they inspire the newcomers to avoid the old path of pollution first and treatment second. Starting from the truth, the balance between economic development and resources environment should be maintained well.

Chapter Six firstly shows China's corporate environmental responsibility development stages. The typical cases, such as Beijing Tong Ren Tang, Jinan Iron and Steel Company and Inner Mongolia Yili Resources Group, then demonstrate the good performance of CER. Finally, it traces the timeless wisdom of Chinese ancient environment and system concepts, pointing out that Chinese enterprise sustainable development is deep-rooted.

Chapter Seven describes the status of resources in China. It points out the enterprise environmental pollution problems, such as water pollution, air pollution, solid waste pollution, negative impact of foreign direct investment enterprises, inefficient energy use and the absence of electronic waste management. From the perspective of SDS, the emergence of problem involves three main responsible parties—business, government and the public. Survey shows that enterprise managers have some bias on CSR awareness. Local enterprises still are not mature enough in CSR strategy and corresponding management system. Small and medium-sized enterprises lack due attention to environmental protection. Some local governments conduct local protectionism under the guidance of error performance concept of pure pursuit of economic

interests. They become the umbrella and shield of environmental violations. Law deficiencies, absence and inadequacy of government environmental responsibility provide convenience for the negative behavior of foreign companies' environmental pollution in China. Poor public participation in environmental protection, general inadequacy of urban residents' energy saving behavior and low rural residents awareness of environmental issues have led to some supervision and support vacuum. Better responsibility fulfillment only comes from addressing these problems.

Chapter Eight mainly launches an empirical research on 30 heterogeneous enterprises. The goal is to understand their environmental responsibility awareness, the actual situation of implementation, and provide a reference for building key indicators of CER. This chapter refers to the pluralism value and methodology of systematic science which rose in 1980s. The system approach of cluster analysis and factor analysis is used. It is an effective complement of SDS methodology, reflecting the developing regulation of difference cooperating and integrity improving laws of SDS. It also provides corporate environmental management focus.

Chapter Nine is based on the improvement and suggestion for China's CER. Based on China's real situation, combining the empirical analysis, it puts forward the countermeasures: establishing the trinity of government, business and the public set up collaboration. From the level of government, to implement CER, government sectors should design better systems, which should not only be future-orientated but also consist of China's operational rules. Firstly, the policy of extended producer responsibility is initially implemented in OECD countries to regulate environmental management. This policy enables producers to expand their responsibility to the post-consumer waste stage of the product life cycle. At present, China needs to draw on the experience of OECD countries and promote producers to bear the waste disposal cost, in order to reduce consumer waste emissions. Secondly, it establishes an example of successful changes of China's modern industry near the Suzhou River. Shanghai municipal government policies and initiatives for the environmental management provide a positive reference: with the government-led industrial restructuring, the tertiary enjoys a boom, replacing the secondary industry; business, real estate, tourism and creative industries have become a major industry beside the Suzhou River. By the coordinated development of the river, its industrial charm is reproduced, replacing the low-tech growth model with previous high material consumption, high energy consumption and high environmental pollution. Thirdly, the government should strengthen the environmental e-government: the government starts to use e-government to carry out environmental management. Through network, the modern information technology, government promotes environmental policies,

discloses environmental information, improves public environmental awareness, encourages public participation, strengthens public oversight, upgrades the work of environmental protection department and achieves governmental enterprise and public interaction in all directions. From the business level, the implementation of ISO140001 environmental management strategies and building corporate environment culture is the core of CER. Environmental management strategy is that the companies try their best to reduce the negative environmental impact of their products throughout the life cycle. Environmental management system is a system which prevents negative environmental impacts and improves environmental performance through the implementation of various environmental projects and technologies. Project management system includes staff training and education, internal environmental audits and monitoring of continuous production processes. Corporate environmental management strategy is divided into three levels: simple compliance with environmental laws; environment competitive advantage strategies and company performance improvement. From product design to equipment input, the company should reach the best environmental aspects—sustainability. The environmental interaction of various enterprises in the supply chain originates from the interaction of the government, suppliers, brokers, consumers and competitors. The supply chain members should consider the environmental issue from the whole system perspective. From the public level, public participation is imperative. Specifically, moderate consumption, social services and public participation should be implemented. From the practice of China's Institute of Public and Environmental Affairs, the function of non-governmental force can be found and the innovation of "internet + environmental protection" proves to be effective. The feedback from the public can make up for the absence of government services and inadequacy of enterprise awareness in a certain extent. They take a role in promoting the green business construction.

Chapter Ten is based on conclusion and prospect. From the perspective of SDS, we can examine the historical background and theoretical basis of CER creation and development. By comparison and empirical study, we can understand the special nature of Chinese enterprises, which are on different degrees and aspects from developed countries in CER practice. We can learn and explore the helpful concept and measures for the Chinese enterprises sustainable development. Chinese enterprises growth is rooted and supportive. The whole society should actively participate in environment protection for harmonious community.

4. RESEARCH METHODOLOGY AND EXPECTATION

The research approaches adopted are historical analysis, comparative analysis and empirical analysis.

Through historical analysis, we can examine the historical background and theoretical basis of CER emergence and development. We can explore the cultural origins and existing result of China's CER. From this, we can recognize that the development of China's CER is deep-rooted.

Through comparative analysis, we can understand the special nature of Chinese enterprises from different degrees and aspects. This can help Chinese enterprises to learn the valuable concepts and measures of sustainable development.

Through empirical analysis, this research is expected to reach two targets: Firstly, expand a number of heterogeneous corporate research, including chemical, manufacturing, electronics, medicines, clothing and food industries. Consequently, we can understand the awareness and performance of CER and set up initial construction of key indicators for CER system. Secondly, make qualitative and quantitative comparison in homogenous (car) companies. Learn the advantages from developed countries to make up the disadvantages of domestic industry.

5. SUMMARY

CER is an important aspect of CSR. CER research has practical significance for business survival and development, curbing environmental degradation and building a harmonious society. The innovation of this research is to study CER from SDS perspective. The basic views of SDS refer to systematic point, progressive point and time and space point. The basic rules of SDS are the organization emerging law, difference cooperating law, structural and functional law, class transferring law and integrity improving law. These views and laws explore the interconnected system and interactive nature of the material world. They also reveal the inner source, fundamental driving force, basic state and overall trend of the systematic world. From SDS perspective, we can examine the historical background and theoretical basis of CER emergence and development. Through comparison and empirical study, we can understand special nature of China's CER from different degrees and aspects with developed countries. We can learn and explore the helpful notion and measures for Chinese enterprises sustainable development. This research adopts the approaches of historical analysis, comparative analysis and empirical analysis. The research target is to complete the CER study of heterogeneous enterprises and CER analysis of homogeneous enterprises.

REFERENCES

Carson, R. (1962). *Silent Spring.* New York: Fawcet Crest Books.

Greenspan, R.G.B. (2001). *(Dai Xingyi et al*. translated.) Hot Planet: Climate Crisis, to Cover up the Truth or Seek Countermeasures Shanghai Translation Press.

Hegel. (1957.). *Lectures on the History of Philosophy.* Beijing: Commercial Press.

Hong, T. (2006). *Corporate Social Responsibility Promotion and its Mechanism* (pp. 49-50). Beijing: Economic Management Publishing House.

Hong, W. (2011). Study on the Low Carbon Responsibility Index of CNPC *Proceedings of the 1st Corporate Governance Conference,* 200-209.

Jie, W. (2003). *Systematic and Dialectical Science* (p. 3). Beijing: People Press.

Laszlo, E. (1997). *(Li Yinbo et al*. translated.) Fateful Choice: a Choice to Survive the 21st Century. Life Reading and New Knowledge Joint Publishing House.

Maureen and Kane. (1998). *(Ma Shengli translated.) The Earth and the Motherland* Reading and New Knowledge Joint Publishing House.

Micheal, A.J.M. (2000). *(Luo Lei et al*. translated.) Dangerous Earth Jiangsu People Press.

Pang, S. (2009). *General Sociological Theory.* Shanghai University Press.

Rifkin, J. (1991). *Biosphere Politics: A New Consciousness for a New Century* (p. 67). New York: Crown Publishers.

Schmidheiny, S. (1992). *Changing Course: A Global Business Perspective on Development and the Environment.* Cambridge, MA: MIT Press.

Villiers, M.E.D. (2001). *(Yan Weiming translated.) Water: the Impending Crisis of Survival* Shanghai Translation Press.

Wang, G. (2006). *The Social Responsibility and Sustainable Operation of Modern Enterprises. China Corporate Social Responsibility Report* (p. 360). Beijing: China Financial and Economic Publishing House.

CHAPTER 2

Literature Review: Theory and Evolution of Corporate Social Responsibility

Abstract: The discussion on Corporate Social Responsibility (CSR) has evolved from the classical concept into the modern one of CSR. Many scholars, such as Bowen, Carroll, Frederick, Drucker and Wood, have contributed various viewpoints to define it. It has gone beyond the previous business scope and transferred to the responsibilities of stakeholders, concerning shareholders, employees, consumers, communities, customers, government, *etc*. The moral constraints are essential for the business operation in globalisation. It is not only the business operation philosophy, but also the management evaluation system constraining the internal enterprises, including the business partner behaviour. It not only highlights the technical progress for seeking profit, but also shows concern for the people, environment and the influence on the society in the process of production. With the social and economic development and the corporate boundaries expansion, enterprises will pay more attention to stakeholders. Corporate Environmental Responsibility (CER) is defined such that enterprises take into account their own behavior on the natural environment and adopt a responsible attitude to reduce their own negative externalities down to the possible level with the aim at becoming "resource saving" environmental enterprises in economic activities. CER has been an important aspect among the well-known theories: the notion of sustainable development, the theory of social contract, legitimacy, stakeholder, circular economy and externality, *etc*. Undoubtedly, CSR is a very extensive topic. CER is the core. Through literature review, the evolution progress is clearly visible, when the enterprises change from "economic man" to "social man" and to "environmental man".

Keywords: Corporate environmental responsibility (CER), Corporate social responsibility (CSR), Economic, Ethical, Evolution, Legal, Philanthropic, Theory.

The CSR theories originated from the western developed countries. After the industrial revolution, the expansion of business triggered a series of social problems, which raised interest in CSR study. The CSR evolution is the embodiment of system view, time and space view and progress view of SDS.

1. CSR CONCEPT AND LITERATURE DEVELOPMENT

CSR concept is a diversified and dynamic concept. Bowen (1953) wrote the outstanding *Social Responsibilities of the Businessman*. The book focused on the

doctrine of social responsibility, which served the guidance for business in the future. Therefore, Bowen deserves the honor of the Father of Corporate Social Responsibility (Carroll, 1999:291). In the following decade, CSR literature developed considerably. Great events, people and ideas in the movements, such as women's right, consumer's right and the environment movement, were important to characterize the social changes during the period. The dominating academics included Davis (1960), Frederick (1960), McGuire (1963) and Walton (1967) and business practice literature gradually emerged (Carroll, 1999, 2008; Lee, 2008). In 1970s, there was a surge of CSR definitions with a trend towards CSP emphasis (Carroll, 1999; Sethi, 1975). The most notable contributions came from the works of Johnson (1971), Davis (1973), Steiner (1971), Eells and Walton (1974), Preston and Post (1975) and Carroll (1979). According to Carroll (1979:500), "The social responsibility of business encompasses the economic, legal, ethical, and discretionary expectations that society has of organizations at a given point in time". There were more attempts to measure and conduct CSR in the 1980s. Jones (1980), Drucker (1984), Wartick and Cochran (1985) and Epstein's (1987) contributions were highly noticeable. In the 1990s, Wood (1991) expanded and created a CSP model that captured CSR concerns.

It was Carroll that expressed CSR more precisely when he contended that the economic and legal responsibilities are "required", and the ethical responsibilities are "expected" and "desired". In this way, he made a distinction between the traditional and the new responsibilities of a corporation. The corporate economic and legal responsibilities reflect the classical social contract between business and society. Alternatively, the corporate new responsibilities embodied in the ethical and discretionary/philanthropic responsibilities reflect broader, social contract between business and society. The economic responsibility is "to produce goods and services that society desires and to sell them at a profit" (Carroll, 1979:500). Thus, companies fulfill their primary responsibility as economic units in society. As Drucker (2006:76-77) added, "A profitability objective therefore measures not only the maximum profit the business can produce, but also the minimum it must produce". The corporate legal responsibility refers to the obligations put on business. Carroll (1991:41) regards the laws and regulations as the "codified ethics" of society. They stand for "partial fulfillment of the social contract between business and society". The following pyramid model (Fig. **2.1**) created by Carroll (1991) clearly manifests the CSR structure and function.

From the beginning, CSR appears to be the amendments and additions to the traditional principles of maximizing profit for shareholders. As a system, CSR has historical and social nature, we have to explore it in a systematic and dynamic way. With social development, there are urgent problems to be solved. From the perspective of SDS, we suggest that CER, an important aspect of CSR, should be

considered for further research, especially in the current context of low carbon economy.

Fig. (2.1). The CSR Pyramid Model. (Source: Carroll, 1991).

2. CHINESE SCHOLARS' VIEW

Chinese also have their understanding of CSR with characteristics.

From the analysis perspective, Yu Xuda (2006) mentioned two important research schools in CSR in the public view. One is from a social perspective, defining what CSR is. It thinks that CSR involves enterprise considering and meeting the economic, technical and legal requirements. The place where the law requirements end is just from where the social responsibility begins. Another one is from the business operations perspective, concerning whom enterprise should be responsible for. CSR is regarded as the social responsibility beyond the economic and legal ones that enterprise should bear to its main stakeholders. The two schools have strong complementary and internal consistencies. Other researchers integrate the two dimensions of the CSR and propose the CSR and stakeholder matrix. The matrix defines CSR from the perspective of what kind of economic, law, ethical and charitable responsibility the enterprises should take for various stakeholders, such as the owners, consumers, employees, communities, competitors, suppliers and other social pressure groups. People are provided with an available conceptual framework to understand and discuss CSR. For example, Zhou Yong (2004), in his article entitled 'The concept and value of CSR in the market economy', believes that business is a basic unit of society and economic entity. Its stakeholders refer to all the individuals and groups, which have close interests with them. He thinks the specific meaning of CSR includes the following

aspects: The first is the social responsibility of business to investors. The second is the social responsibility to employees. The third is the social responsibility to consumer. The fourth is the social responsibility to suppliers. The fifth is the social responsibility to community and all citizens. The five CSR is corporate self-discipline responsibility, which is advocated by the society. Although in the present circumstances, the society need to add the mandatory discipline. These CSR should be pursued as a moral ideal. Meanwhile, in a market economy, enterprises are not only the independent economic entity, but also the ethical entity with legal personality. Therefore, it has an important value for enterprises to take corresponding social responsibility economically and ethically.

As far as the concept division is concerned, Liu Cheng (2006), in his article 'Definition of the concept of Corporate Social Responsibility', proposed that the CSR connotation can be divided into broad meaning, context meaning, narrow meaning and denotation. Broad meaning refers to the social agreement obligations on product quality on the formation of social negotiations. It is the corporate friendly response to stakeholders based on the corporate image. The context meaning refers to the enterprise obligations regulated by the social responsibility certification standards, in addition to the broad meaning context. The narrow meaning refers to the labour law and environmental obligations which should be complied by the suppliers under the guarantee of enterprises. The denotation means both enterprise own obligations and joint obligations with the suppliers, both treating labour obligations and environmental-friendly obligation, both active responsibility and passive responsibility. In his article entitled, 'On the CSR in the Transitional Economies', Zhang Fan (2005) states that, from the perspective of economics, when the company's private costs depart from social costs, company has to bear the marginal social cost and provide logical explanation from the externality and related property rights. He stated that enterprises, as the market substitute, save the transaction costs and promote the economic and social development. This is the positive external effects. However, they also generate a lot of negative externalities. In this case, social cost includes the cost of private producers and the cost of spectator who are adversely affected. Li Liqing (2006) introduced the law of 'the denotation and connotation of generic-specific concepts have inversely proportional relationship' in the CSR research. There is a well-known formula: specific concept = generic concept + specific difference. He thinks that CSR is a category, which is the highest 'species concept'. When it is linked to the specific connotation, there will be a certain specific difference and thus the different specific concepts emerge. The business entity appearing in the economic, legal and social fields respectively is 'specific difference'. The three specific aspects of corporate economic responsibility, legal responsibility and social responsibility are formed by linking with the three specific difference. Therefore, from the simplest sense, CSR refers to the 'third responsibility' in

addition to economic responsibility. It is the 'responsive obligation' of business in the social context. The coexistence of corporate social, economic and legal responsibility must be taken by companies. With social changes, CSR has the nature of 'mobility', which is the result of 'power' and 'obligation' exchange in the business resources allocation process.

On the essence recognition, Zhang Fan (2005) believes that the essence of CSR is that corporate should bear the marginal social cost, internalize the external cost and generate hard budget constraints. When corporate behaviour leads to negative externalities, government regulation is not the only solution. The externalities can be internalised by private solutions, such as taking Pigovian taxes micro-regulation and tradable pollution permits. Chen Yadong (2005) states that corporate should adjust the conflict of interest with other social members in the profit operation. In order to protect the stakeholders' benefit, the corporate operation activities must be controlled to a certain extent. It will enable the corporate to take social responsibilities and keep the balance with the stakeholders benefit. It is because the corporate interest and social interest are integral, enterprise behaviour has the self and social impact natures, CSR have come into being. Therefore, the essence of CSR for the corporate decision makers is to make profit and take the necessary measures to protect and promote social welfare obligations.

On the building CSR issue, Hui Ning and Huo Li (2005) proposed three concentric circles. The first is the innermost circle, including the effective implementation of economic functions of the basic responsibilities (product, employment, economic growth, *etc*.). The second is the middle circle, including the positive responsibility (environmental protection, employment and employee relationship, reputation expected by the customers, fair treatment and injury avoidance, *etc*.) enterprises take when they implement these economic functions and require the change of social values and priority. The third is the most outer ring, including the emerging and uncertain responsibility. In other words, the enterprises must ensure more and more participation in the activities to improve the social environment. The traditional CSR is only focused on the first circle. New ideas go beyond it. CSR fulfilment does not mean the profit reduction, but the self-interest of the enterprise within the scope. On this basis, the author proposes that the building of CSR must take the investor as the core and five full considerations to shareholders, employees, consumers, communities, the government's interest and meet the requirement of relevant interest groups. That is to say the enterprises should seek maximum profit of shareholders, provide staff with a good working environment, provide consumers with first-class service, show enthusiasm in the community building and be subject to national interests. Chen Yadong (2005) believes that system should be designed and legislation

should be absorbed with the purpose to achieve the stakeholders care and concern in the real life. As far as the systematic designation is concerned, there are two ways to be concerned. One is reconstructing of corporate governance and turning the shareholders centrism into board of directors centrism. The other is the clear legislative regulation, which expressly incorporates the CSR civilization into the law track.

Based on the above literature, we can see that the discussion on CSR has evolved from the traditional classical concept into the modern concept of CSR. In other words, CSR goes beyond the previous business scope and transfers to the stakeholders responsibilities, which concerns shareholders, employees, consumers, communities, customers, government, *etc*. The essence is the moral constraints of the business economic behaviour in the context of economic globalisation. It is not only the business operation philosophy, but also the management evaluation system to constraint the internal enterprises, including the business partner behaviour. It not only emphasizes the technical indicators for seeking profit, but also put emphasis on the concern for people, the environment and contribution to the society in the production process. With the social and economic development, and the expansion of corporate boundaries, enterprises will pay more attention to stakeholders. The meaning of CSR will also be extended.

3. CER THEORIES

In the early 1990s, disputes arose on the sustainable social environment and human coordinating development in the international community. It caused the stakeholders to involve in the discussion of how the enterprises can develop. Since then, CSR has gained more and more right to speak. Business is the cell of market economy and it is the economy that directly creates the social wealth. From the relationship between the enterprise economy and social environment, business goals should not only maximize shareholder value, but should also include the whole range of social responsibility of stakeholders, including shareholders, employees, consumers, communities, customers, government and society. Based on the systematic perspective, companies should be clearly aware that their development can not be separated from the environment and society.

Today, the environmental problems are increasingly pressing. In the “Eleventh-Five-Year-Plan”, the state made a clear requirement that China’s one thousand important coal companies must save one hundred million tons standard coals. In the “comprehensive energy conservation program”, Development and Reform Commission made its objectives and tasks more clear in 2010 to achieve energy saving. According to the program, China’s ten thousand yuan GDP energy

consumption in 2005 will fall from 1.22 tons standard coal to 1 ton standard coal in 2010, reducing by 20 percent. Unit industrial added value water consumption will be cut by 30%. During the "Eleventh-Five-Year-Plan" Period, China's major pollutant emissions will be reduced by 10%. From 2005 to 2010, sulfur dioxide emissions reduced from 25.49 million tons to 22.95 million tons, chemical oxygen demand (COD) reduced from 14.14 million tons to 12.73 million tons. The rate of national urban sewage treatment will be no less than 70% and comprehensive utilization of industrial solid waste will be more than 60%. During 2006 and 2007, from nearly one hundred different companies survey summary, we found that the vast majority of enterprises put environmental responsibility at an important position of CSR and many companies believe in the first place of environmental responsibility of CSR. Facts have proved that environmental protection is imperative, and companies can find development opportunities in it (Schmidheiny, 1992; Worldwatch, 1994).

In economic activities, CER requires enterprises to seriously consider their own behavior on the natural environment and adopt a responsible attitude to reduce their own negative externalities down to the acceptable level in order to become "resource saving" environmental enterprises (Wang, 2009).

CER is an essential aspect among the well-known theories, such as the view of sustainable development, social contract theory, legitimacy theory, stakeholder theory, circular economy theory and externality theory, *etc*. These theories have greatly contributed to the environmental issues in terms of environmental civilization development mode, environmental protection and economic operation pattern, business economic dependent relation and social resources optimal allocation, *etc*.

3.1. The View of Sustainable Development

Since 1960s, there have been growing concerns about environmental problems. The harmful impacts of humans on their life support system have been reported by scientists and scholars (Carson, 1962; Commoner, 1972; Birch, 1975; Ehrlich & Ehrlich, 1990; McMichael, 1993; World Resources Institute, 1994). On a large scale, the main impacts of humans on the environment have been summarized by Mark (2000:20): changes, possibly irreversible, to the mixture of the atmosphere and therefore to the earth's climate; devastation of stratospheric ozone and therefore more damage to living organisms from ultraviolet light in sunshine; topsoil deterioration and desertification increment; loss of biological diversity; damage to photosynthesis and nutrient cycles; extensive pollution of air, rivers and oceans; artesian water consumption storages, *etc*.

The environmental crisis threatens the human survival, restricts economic

development and affects social stability. With frequent occurrence of astonishing pollution, environmental resources became exhausted. People began to reflect the traditional approach of high input, high consumption, high speed and high development in pursuit of high enjoyment, and recognize that it would lead to tragedy. Originated from the global environmental crisis, the view of sustainable development is human insight into environmental issues.

The best known definition of sustainable development comes from the Brundtland Report (WCED, 1987). The report "Our Common Future" stated "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs", which is the normal definition of sustainable development which has been accepted by everyone subsequently (Aras and Crowther, 2012:147). The report stated that previously we were concerned about the economic impact on the environment, and now we had sensed the environmental pressures on the economic development. It is an important leap in human thinking, which transferred from the general concern of environmental protection to the combination of environmental issues and economic development. It includes two basic points: Firstly, the human right to pursue healthy and fruitful life by means of technology and investment should be harmonious with nature, rather than depleting resources and destroying environment. Secondly, when current generation pursues the contemporary development and consumption, they should share the equal opportunity with their descendants. They should not be allowed to pursue their present development and consumption selfishly and mercilessly depriving the future generation's opportunity to enjoy the same development and consumption. The surface meaning of sustainable development is that the country should care for sustainability and prevent non-sustainability in the economic and social development. But the basic essence requires us to shift to the new development approach of environment civilization, removing from the traditional development of industrial civilization. This means that we have to know that the nature itself has the right to development, and natural cost should be fully taken into account in the human social development. The true development only belongs to the one who effectively maintains the natural continuity at the minimum cost of nature.

3.2. Social Contract Theory

It is generally known that social contract theory emerged during the Enlightenment in response to the changes when human beings came to live together in small families and clans, then, as they set up small communities (Rousseau, 1987). Social contract theorists (Gauthier, 1990; Rawls, 1993; Locke, 2003) assert that for a social function, there must be a real or hypothetical agreement regarding the rights and responsibilities of both the state which strives

for advancing the common good and its citizens who engage in advancing their self-interests. In order to implement this contract, every member of society is presumed to agree to its terms. In short, it is the view that persons' moral and/or political obligations are dependent upon a contract or agreement between them to form the society in which they live.

It is apparent that human community is the cause of the social contract theory, which is undoubtedly with us for the foreseeable future. Entering the environmental century of, the global changes will continue to pressure us to think and rethink the nature of our relations with one another. And a new social contract for science is urgently needed (Lubchenco, 1998:491-497).

How is our world changing? The most obvious alterations are disruptions of the global climate (IPCC, 1995: 9-49), depletion of stratospheric ozone (Rowland, 1989), irreversible losses of biological diversity (Lawton and May, 1995), and changes in the structure and function of ecosystems around the world (Schulze and Mooney, 1994; Mooney *et al.*, 1996). The world is changing in very many important ways as well. Inequity among all nations has increased; new infectious diseases have emerged; technology, communication, and information systems have experienced revolutionary changes (Kennedy, 1993; McNeely, 1997). Most people are well aware that humans extract goods from nature: seafood, game animals, fodder, timber, fuelwood, genes, and pharmaceutical products, *etc*. Until recently, little attention has been paid to another benefit provided by natural ecological systems, the fundamental life-support services without which human civilization would cease to thrive (Daily, 1997; Baskin, 1997). These "ecosystem services" include the purification of air and water; detoxification and decomposition of wastes; renewal of soil and soil fertility; maintenance of biodiversity; protection from the harmful UV rays; moderation of temperature extremes and provision of aesthetic beauty, *etc*. (Daily, 1997).

Confronting the environmental degradation and scarcity of resources, Lubchenco (1998:494) proposed that national security, social justice, economic growth and human health are properly regarded as the environmental issues because each is dependent, to some degree, on the structure, function, and resiliency of ecological systems. She also proposed that the scientific community should formulate a new Social Contract for science. The Contract has to recognize the extent of human domination on the planet. It should express a commitment to harness the full power of the scientific enterprise in developing new knowledge to communicate present and new understanding to the public and to policy-makers, and in helping society move toward a more sustainable biosphere (Lubchenco, 1998:495). With the scientific social contract, the human-dominated society will be more ecologically sound, economically feasible, and socially just.

3.3. Legitimacy Theory

Legitimacy theory posits that corporate disclosure reacts to the environmental (economic, social, political) factors and disclosures legitimize actions (Preston and Post, 1975; Hogner, 1982; Lehman, 1983). This theory is based upon the notion that business operates in society *via* a social contract where it agrees to perform various socially desired actions in return for approval of its objectives, rewards and ultimate survival. It is acknowledged that legitimacy is conferred by outsiders to the corporation, but may be controlled by the corporation itself (Ashforth and Gibbs, 1990; Buhr, 1998; Dowling and Pfeffer, 1975; Elsbach, 1994; Elsbach and Sutton, 1992; Woodward *et al*., 1996). This shows that changes in social norms and values result in organizational change and also lead to organizational legitimation (Gary 2002:346). A number of scholars (Lindblom, 1994; Deegan and Gordan, 1996; Deegan and Rankin, 1997; Wilmshurst and Frost, 2000; O'Donovan, 2002) have particularly focused on environmental disclosures. They agreed that environmental disclosures were used to restore legitimacy (David, 2003:358). According to legitimacy theory, companies will be penalized if they are not consistent with social expectations, perceptions or values. As far as the environment management is concerned, a company's environmental value system must be congruent with the green value system, which belongs to the larger social system. When a disparity, actual or potential, exists between the two value systems, the company's legitimacy will be threatened (Dowling and Pfeffer, 1975:122). In short, in order to continue operating in the dynamic society successfully, corporations must act within the bounds of what society identifies as socially acceptable behavior, especially in environmental performance.

3.4. Stakeholder Theory

Stakeholder theory is probably the most influential theory to emerge in the CSR area (Stark, 1994). It was developed and presented by Edward Freeman in the 1980s. Freeman's (1984:46) original definition is perhaps the most widely quoted: "A stakeholder in an organization is …… any group or individual who can affect, or is affected by, the achievement of the organization's objectives." Evan and Freeman (1993:166) then suggested two simple principles:

1. Principle of corporate rights, which demands that the corporation has the obligation to respect the rights of others; and
2. Principle of corporate effect, namely, companies are responsible for the effects of their actions on others.

In fulfilling CSR obligations, organizations are expected to engage with their stakeholders through different initiatives and activities. Stakeholder theory is typically focused on the quality of the actors in the relationships of the firm and

the stakeholder.

Recently the corporate environmental responsibility has been strengthened by the stakeholder theory. According to Clarkson (1995), stakeholders are individuals or groups who influence or are influenced by the company's activities. The environment literature (Henriques and Sadorsky, 1999) emphasizes on four critical groups of stakeholders:

Regulatory stakeholders include: government, trade associations, informal networks, and a given firm's competitors; subjects other than government may have the power to lobby the government to take part in environmental protection;

Organizational stakeholders: shareholders, customers, employees, and suppliers; all of them are directly linked to an organization and exert their profitability directly;

Community stakeholders: community groups and environmental organizations which can mobilize public opinion;

Media stakeholders: this group may have influence on society's perception of a company (Ica, 2001:43).

Non-governmental organization (NGO) is another kind of the stakeholder group, who plays important role in environmental issues. Although NGOs have no contract with the business and no market relationship, they are watchdogs of business behavior and drivers of change where unacceptable behavior is observed, for example, excessive pollution from a factory (Schaltegger, *et al.*, 2003:36).

The above classification has identified the different stakeholders in the society, and the company must have definite environmental responsibility to survive. If enterprises do not take into account of their interests and power, there is a danger that the process of value creation will be impaired (Jones, 1995; Nasi, 1995). This is advisable for the management to take into account the different stakeholder groups in their environmental actions.

3.5. Circular Economy Theory

Circular economy means closing material cycle economy and resources circulate economy. It aims to make efficient and recycling use of resources. The principle has 3 "R"s: that is to reduce, reuse and recycle materials. The feature is material closed loop. The economic model is in line with the operation of material circulation and energy flow systems. It requires human beings to consciously comply and apply environmental law, actualize the low emission and even zero pollution emission, and achieve the "win-win" goal of economic growth and

environmental protection (Zhang, 2004:48; Ren *et al.*, 2005:131). This idea combines the clean production and environmental industries. It broadens the environmental protection to all relevant areas of the national economy. It manages the environment protection and economic operation mode integratively. This greatly enhances the depth and width of environmental thinking.

In 1960s, American economist Kenneth Boulding suggested the "spaceship theory", which was the budding notion of circular economy. However, little attention has been paid at that time (Zhu and Zhu, 2006:46; Feng, 2007:10). During 1970s and 1980s, the main concern of environmental consequences was caused by economic activity, and mechanism of economic operation always fell out of people's sight. In 1990s, sustainable development strategy became a global trend. Source prevention and whole process governance replaced end treatment and became the mainstream of international development policies. With continual exploration and reflection, as well as the main line of resource use maximization and pollution minimum, people gradually integrated cleaner production, resource utilization, environmental design and sustainable consumption into the-circular-economy-system-strategy.

The main features of circular economy are as follows: The first feature is multiple loops of material flow. It requires economic activities to become a process of "resources-products-renewable resources", in which material repeatedly cycles and flows, in terms of the operational regulation and pattern of the natural environment system. It will enable the entire economic system and production and consumption process to produce little waste. This will gain the zero emission of waste. The characteristic of low input of natural resources, high utilization and low emission of waste resolved the conflict between environment and development, which is long existed. The second feature is scientific and technologically advanced pilot. With the progress of the two aspects, people can make active use of harmless or less harmful new technology to reduce the raw material and energy consumption, achieve low input, high output, low pollution and eliminate the environmental pollutants in the production process as much as possible. For example, from the pollution mining, processing, transportation, use, recycling and final disposal, people should decide the system resource consumption and pollution emission. Then they can get the material flow conditions and environmental impact of the whole system, based on the assessment of the system economic benefit (Feng, 2007:11). The third feature is the consistent combined interests. Circular economy is based on the natural environment law. It transfers the traditional industrial economic system of mass production, consumption and disposal to the new economic system of rational use of material and continuous recycling. In the process of equal access to material and energy efficacy, obtaining natural resources consumption is minimized, the

effectiveness for the society is maximized, and the waste discharge becomes zero. Thus, the harmonization of the environmental, economic and social benefits can be achieved. The participation of the whole society is the fourth feature. Circular economy is an advanced economic structure. However, only advanced technology can implement this economic structure, which is a system of economy, technology and society. Only scientific and strict management can work. Therefore, it is necessary to establish a comprehensive set of operating procedures, build management mechanism, and improve implementation capacity. In order to develop the circulation mechanism, government support is also needed. In addition to the financial support and public policy from the government, it is also important to get the consumers' understanding and support. Through whole participation of industrial enterprises, consumers and government, the overall social interests can be maximized. The fifth feature is clean production model, which is the current main form at the enterprises level. In 1989, the Governing Council of United Nations' Environmental Program proposed the notion of cleaner production. It is to control the pollution in the entire process of industrial production. The core is to incorporate the comprehensive environmental strategy into product design, production and services through changing the product design process route and process, *etc*. In order to minimize pollution and conserve resources, it will reduce harmful products and by-products and achieve the inner loop of waste and emission. The essence of cleaner production is to start from the pollution sources and use all measures to decrease the harmful impact on the environment in the production and service processes (Feng, 2004: 18-20).

In short, circular economy highlights technological development and pays an overall attention to system, mechanism, administration and culture. It is a kind of deep ecology and is in line with keeping balance between man and nature.

3.6. Externality Theory

Externalities occupy a rather prominent position in the modern research field. With the increasing complexity of modern technology and society, additional unwanted side effects occurred and a more theoretical view of externalities is required.

The concept of externalities originated from one statement of Alfred Marshall, who published "Principles of Economics" in 1890. He divided the production scope expansion in economic activities into two types. The first type was the general development of production expansion; The second type is the production extension from the efficiency of individual enterprise own resource organization and management. The first type can be regarded as "external economics" and the second type "internal economics" (Marshall, 1997).

Pigou further studied and improved the externality issue in his famous work "The Economics of Welfare". He proposed the concepts of "internal non-economics" and "external non-economics". From the view of optimal allocation of social resources, he applied the marginal analysis method, proposed the concepts of marginal social net output and marginal private net output, and finally he established the externality theory. In economic activities, if an enterprise causes unpaid losses to other enterprises or the whole society, the external non-economics occurs (Marshall, 1997). Using Pigou's words, we say that when an externality is present, there is a divergence between private and social cost (Dahlman, 1979:141).

Coase did not define "externality"; however, he proposed the concept of "transaction cost" in his classic paper "The Problem of Social Cost" (Coase, 1960). He concluded that as long as the property rights were clarified, the externality problem could be resolved by compensation after consultation, in order to realize the internalization of externalities. This is the Coase Theorem (Coase, 1988). However, the Coase Theorem has its limitations: If the transaction costs occurred in the negotiation are rather high, or if the victim numbers affected by the negative externalities are quite large, it will be difficult to resolve the compensation through negotiation. However, when the transaction costs exceed the compensation, the negotiation motivation will be lost and the trade agreement is impossible to be achieved. When there are many victims of negative externalities, there will be serious "free rider" mentality, which will stop the agreement of negative externalities.

In 1968, Dales further developed Coase's theory. He introduced the notion "property" to the pollution control field. In his book entitled "Pollution Property and Price", Dales proposed the explicitly initial pollution property and stated that the conferred transaction could reduce the environmental pollution problem. According to him, pollution is actually a kind of property conferred to the enterprises with pollution in the legal system established by the government. Different from the initial designation, the pollution property conferred by the government should be transferred and used to improve the environmental resources efficiency by the means of market transaction (Lu, 2009:4). This statement was later verified by Baumo and Oates (1988) theoretically.

Since 1970s, the externality theory began to integrate with ecological economics and environmental economics. The most representative work was "Theory of Environmental Policy", which was collaborated by Baumol and Oates (1988). They defined externalities as 2 conditions in their work:

1. The individual A's utility or production relationships include some practical (*i.e*. non-monetary) variables. His value is decided by others (individuals, business and government), but his welfare affected is not taken into account.
2. He has not been identified on the basis of his behavior with others and has not paid the compensation (or payment) of the impact on others when his behavior affects other people or enter into other people's production function in decision making.

These two conditions can be summarized as: the external welfare receptor has been affected but got no consideration; the applier "inadvertently" affected others but did not get or pay compensation.

In short, externality on the environmental issue has a strong explanatory function. When externality occurs, market dependence can not solve the damage, this is so-called market failure. When negative externalities happen, the enterprises output will be far greater than the Pareto optimal production. While in the positive externalities, the enterprises output is much smaller than the Pareto optimal production. Therefore, it is the ultimate goal of externalities internalization to achieve the optimal externalities. So far, four ways can be used to achieve the optimal externalities: Pigou taxes or subsidiaries, government direct interventions, property transactions and court negotiations (Li, 2007).

3.7. C Mode Theory and Other Chinese Scholar Views

In the article entitled "C Mode: China's Development in the Condition of Natural Resources Scarcity", Tongji University Professor Zhu Dajian (2005) stated that C mode was different from traditional mode and the third path of the post-industrial mode; it stood for the English word "China", which is a suitable scenario. In this scenario, there is a suitable requirement for the development mode reform, which can be managed under the current technology and system conditions. He estimated, "Natural productivity or unit environmental load should improve with economic growth. At the same time of population and economic growth, the 2020 environmental load will be essentially flat or slightly increased." The connotation of Chinese choice of C mode is to achieve the 4 times economic growth by 2020, while the resource and energy consumption will be less than 2 times in 2000 at the accomplishment of low pollution emission growth or zero growth.

Fudan University professor Xiao Wei (2005), in his article entitled "Environmental Right as Human Right and Sustainability Development", stated that environmental right reflected the high attention to the development and environmental issue by the international community. It is the value preference of all the countries, especially the majority of developing countries, to fully realize

human rights in coordinating economical, social and environmental relations. The trend to realize the environmental rights is to gradually become the legal rights and real rights. Environmental right is not only the individual right, but also the collective right; not only the inner generation right, but also the inter generation right. China's environmental protection cause shows that only the constitutional recognition of environmental right can enable its legal status to obtain legal right basis and further regulate the associated protective measures.

Jia Lihong (2003) made a systematic research on the externalities theory and the policy boundary and reflected the traditional externalities theory. She criticized the traditional externalities theory and commented on China's environmental regulation and knowledge property protection policy. Her conclusion was that, externalities are the subset groups which depend on each other, the externalities role led to the mutually exclusive state of individual rationality and collective rationality, market failure and the complicated externalities which were closely related and evolved by simple externalities. In her opinion, in spite of the prevalent traditional externalities, policies deficiencies, property right transactions, court negotiations and non-government organization actions were quite practical in solving the externalities issue.

Ma Yan (2003), in her article entitled 'Corporate Environmental Protection Responsibility', believed that the corporate environmental protection responsibility originated from the corporate social impact and target achievement, which mainly embodied as environmental moral responsibility and environmental legal responsibility. In order to better protect the environment, achieve environmental fairness and justice and guarantee the human sustainable development, the environmental protection responsibility should be intensified by the social members (including enterprises) in various aspects.

Fan Ying (2005), in her postgraduate thesis entitled 'The Corporate Environmental Responsibility and Achievement Mechanism—from the Perspective of Cleaner Production Law', emphasized the features of CER in cleaner production law and various difficulties in reality. She suggested that enough attention should be paid to the diversity change of legal functions and legal education should be strengthened and guided. She asserted that the integrative adjustment mechanism should be used to improve the CER achievement.

Wu Jiaojun (2005), in his doctor thesis entitled 'The Corporate Environmental Responsibility', discussed the definition of CER, analysis of CER denotation, CER internalisation, corporate environmental management and the system design of CER achievement. Finally, he proposed the establishment of environmental information disclosure system, economic stimulation system, and environmental

responsibility insurance system in order to put CER into practice.

In short, all of the above theories and views focus on the increasingly important environmental problems. The occurrence and resolution of environmental problems are closely related to the enterprise, government and the public. In order to promote the sustainable development, it is a wise policy for the business and the whole society to clarify CER and set up the constraint mechanism of participation of all the entities.

4. LITERATURE COMMENTARY

In summary, CSR is undoubtedly a very extensive topic. CER is a crucial part of it, or its core. Until now, the international academia has studied it from various perspectives. Through literature review, the evolution progress is clearly visible when the enterprises change from "economic man" to "social man" and to "environmental man". When pursuing the maximized self-interest, "economic man" irrationally plunders the nature and causes the environmental crisis, environmental pollution and resources depletion, *etc*. At the same time, it leads to the "social diseases", such as economic crisis, social unrest and moral turpitude. Consequently, it destroys the harmonious development of the society. "Social man" overcomes the traditional economic benefit-oriented value judgement, and regards the maximum of entire social system benefit as the judgement standard and decision basis. In CSR, "environmental man" must include the whole responsibility for the natural environment, that is, all the enterprises behaviours should be consistent with the natural world. This is just opposite to the "economic man" neglecting nature and plundering nature essence and the further development of "social man" in the current environmental crisis. With the aim to extend the CSR to the full responsibility for the whole human society and nature, "environmental man" runs a model of environmental evolution path, which changes from the opposite, conquering and breaking up model to the harmonious, coordinated, restoring and constructive type. Sustainable development resides in the harmony between man and nature. And "environmental man" has a long way to go.

5. SUMMARY

As for China, CSR is not a pure theoretical issue, but a significant reality issue. The international CSR theory foundation, practical analysis and relevant research achievement play the pilot role in enlightening the followers to make further exploration. Most of the current research has been conducted in various aspects of CER; however, there is little special subject research in the environmental aspect, and in-depth study is warranted. Currently, most of the perspectives of CSR are from the economic, legal, moral or management levels. This research concerns

CER from the perspective of SDS, showing the systematic efficacy of structural function, class transferring and difference coordinating. From the international context, plenty of research has been done on the modern entrepreneurship, but the deep cultural ideas have not been excavated. From the condition of China, there are some valuable notions which are competitive, although there is huge gap with developed countries in the enterprises environment management. So this research considers the CER as a system, and makes analysis of the element, structure and function. Through empirical study, it will put emphasis on the internal requirement and external motivation of CER implementation in order to promote the CSR construction in Chinese harmonious society.

DISCLOSURE

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REFERENCES

Aras, G., Crowther, D. (2012). *Governance and Social Responsibility.* UK: Palgrave Macmillan. [http://dx.doi.org/10.1007/978-0-230-34463-1]

Ashforth, B.E., Gibbs, B.W. (1990). The Double Edge of Legitimization. *Organ. Sci, 1*, 177-194. [http://dx.doi.org/10.1287/orsc.1.2.177]

Baskin, Y. (1997). *The Work of Nature: How the Diversity of Life Sustains Us.* Washington, DC: Island Press.

Baumol, W.J., Oates, W.E. (1988). *The Theory of Environmental Policy* (2nd ed.). Cambridge: Cambridge University Press. [http://dx.doi.org/10.1017/CBO9781139173513]

Birch, C. (1975). *Confronting the Future: Australia and the World: The Next Hundred Years.* Harmondsworth: Penguin.

Bowen, H.R. (1953). *Social Responsibilities of the Businessman.* New York: New York University Press.

Buhr, N. (1998). Environmental Performance, Legislation and Annual Report Disclosure: the Case of Acid Rain and Falconbridge. *Accounting, Auditing and Accountability Journal, 11*(2), 163-190. [http://dx.doi.org/10.1108/09513579810215455]

Carroll, A.B. (1979). A Three-dimensional Conceptual Model of Corporate Social Performance. *Academy of Management Review, 4*, 497-505. [http://dx.doi.org/10.5465/amr.1979.4498296]

Carroll, A.B. (1991). The Pyramid of Corporate Social Responsibility: Toward the Moral Management of Organizational Stakeholders. *Business Horizons, 34*, 42-56. [http://dx.doi.org/10.1016/0007-6813(91)90005-G]

Carroll, A.B. (1999). Corporate Social Responsibility. *Business and Society, 38*(3), 268-295. [http://dx.doi.org/10.1177/000765039903800303]

Carroll, A.B. (2008). A History of Corporate Social Responsibility: Concepts and Practices.*The Oxford Handbook of Corporate Social Responsibility* (pp. 19-46). Oxford: Oxford University Press.

Carson, R. (1962). *Silent Spring.* New York: Fawcet Crest Books.

Chen, G., Lei, Z. (2006). *Definition of Corporate Social Responsibility. Chinese Corporate Social Responsibility Report* (p. 17). Beijing: China Financial and Economic Press.

Cheng, Liu (2006). The Concept Definition of Corporate Social Responsibility. *Shanghai Normal University Journal (Philosophy and Social Sciences edition), 5.*

Chen, Yadong (2005). On the Corporate Social Responsibility. *Chongqing Science and Technology College Journal (Social Sciences edition), 3.*

Chen, Yongzheng (2005). The Essence, Condition and Format of Corporate Social Responsibility. *Yunnan Normal University Journal (Philosophy and Social Science edition), 3.*

Clarkson, M.B.E. (1995). A Stakeholder Framework for Analyzing and Evaluating Corporate Social Performance. *Academy of Management Review, 20*, 92-117.
[http://dx.doi.org/10.5465/amr.1995.9503271994]

Coase, R.H. (1960). The Problem of Social Cost. *Journal of Law Economics. 1*(15).

Coase, R.H. (1988). *The Firm, the Market and the Law.* Chicago: University of Chicago Press.

Commoner, B. (1972). *The Closing Circle.* Toronto: Bantam.

Dahlman, C.J. (1979). The Problem of Externality. *Journal of Law and Economics, 22*(l), 141.
[http://dx.doi.org/10.1086/466936]

Daily, G. (1997). *Nature's Services: Societal Dependence on Natural Ecosystems.* Washington, DC: Island Press.

David, C. (2003). Intra- and Intersectoral Effects in Environmental Disclosures: Evidence for Legitimacy Theory? *Business Strategy and the Environment, 12*, 357-371.
[http://dx.doi.org/10.1002/bse.375]

Davis, K. (1960). Can Business Afford to Ignore Social Responsibilities? *California Management Review, 2*, 70-76.
[http://dx.doi.org/10.2307/41166246]

Davis, K. (1973). The Case for and against Business Assumption of Social Responsibilities. *Academy of Management Journal, 16*, 312-322.

Deegan, C., Gordon, B. (1996). A Study of the Environmental Disclosure Policies of Australian Corporations. *Accounting and Business Research, 26*(3), 187-199.
[http://dx.doi.org/10.1080/00014788.1996.9729510]

Deegan, C., Rankin, M. (1997). The Materiality of Environmental Information to Users of Annual Reports. *Accounting, Auditing and Accountability Journal, 10*(4), 562-583.
[http://dx.doi.org/10.1108/09513579710367485]

Dowling, J., Pfeffer, J. (1975). *Organizational Legitimacy: Societal Values and Organizational Behavior.*

Drucker, P.F. (1984). The New Meaning of Corporate Social Responsibility. *California Management Review, 26*, 53-63.
[http://dx.doi.org/10.2307/41165066]

Drucker, P.F. (2006). *The Practice of Management.* New York: Collins.

Eells, R., Walton, C. (1974). *Conceptual Foundations of Business* (3rd ed.). Burr Ridge, IL: Irwin.

Ehrlich, P., Ehrlich, A. (1990). *The Population Explosion.* London: Hutchinson.

Elsbach, K. (1994). Managing Organizational Legitimacy in the California Cattle Industry: the Construction and Effectiveness of Verbal Accounts. *Adm. Sci. Q, 39*(1), 57-89.
[http://dx.doi.org/10.2307/2393494]

Elsbach, K., Sutton, R.I. (1992). Acquiring Organizational Legitimacy Through Illegitimate Actions: a Marriage of Institutional and Impression Management Theories. *Academy of Management Journal, 35*, 699-

738.

Epstein, E.M. (1987). The Corporate Social Policy Process: Beyond Business Ethics, Corporate Social Responsibility, and Corporate Social Responsiveness. *California Management Review, 29*, 99-114. [http://dx.doi.org/10.2307/41165254]

Evan, W., Freeman, R. (1993). A Stakeholder Theory of the Modern Corporation: Kantian Capitalism.*Ethical Theory and Business* (pp. 166-171). Englewood Cliffs, NJ: Prentice-Hall.

Fan, Zhang (2005). On the Corporate Social Responsibility in the Transitional Economy. *Hunan Science and Technology College Journal, 9.*

Feng, Z. (2004). *Circular Economy Introduction* (pp. 18-20). Beijing: Renming Press.

Feng, Zhijun (2007). Normalization Theory Study on Circular Economy. *China Population, Resources and Environment, 17*(4), 10-11.

Frederick, W.C. (1960). The Growing Concern Over Business Responsibility. *California Management Review, 1*, 38-46.

Freeman, R.E. (1984). *Strategic Management: A Stakeholder Approach.* Boston, MA: Pitman.

Gary, O. (2002). Environmental Disclosures in the Annual Report: Extending the Applicability and Predictive Power of Legitimacy Theory. *Accounting, Auditing and Accountability Journal, 15*(Issue. 3), 344-371. [http://dx.doi.org/10.1108/09513570210435870]

Gauthier, D. (1990). *Moral Dealing: Contract, Ethics, and Reason.*

Groner, S., Zapf, M. (1998). Unternehmen, Stakeholder und Umweltschutz (Companies, Stakeholders and Environmental Protection). *UmwelfWirtschaftsForum, 3*, 52-57.

Henriques, I., Sadorsky, P. (1999). The Relationship Between Environmental Commitment and Managerial Perceptions of Stakeholder Importance. *Academy of Management Journal, 42*(1), 87-99.

Hong, W. (2009). *Corporate Environmental Responsibility Research.* Beijing: Economic and Management Press.

Huining, H. (2005). Corporate Social Responsibility Construction. *Revolution.*

Ica, R. (2001). From Red to Green: Towards the Environmental Management in the Country in Transition. *Journal of Business Ethics, 33*, 37-50. [http://dx.doi.org/10.1023/A:1011977116496]

Intergovernment Panel on Climate Chang (IPCC). (1995). *Climate Change* Cambridge University Press.

Jia, L. (2003). Business in Contemporary Society: Framework and Issues, 27 Belmont, CA: Wadsworth.

Johnson, H.L. (1971). *Business in Contemporary Society: Framework and Issues.* Belmont, CA: Wadsworth.

Jones, T.M. (1980). Corporate Social Responsibility Revisited. Redefined. *California Management Review,* 59-67. [http://dx.doi.org/10.2307/41164877]

Jones, T.M. (1995). Instrumental Stakeholder Theory. *Academy of Management Review, 20*(2), 37-404. [http://dx.doi.org/10.5465/amr.1995.9507312924]

Kai, Z. (2004). Discussion on Circular Economy Theory. *China Population*. *Resources and Environment, 14*(6), 48.

Kennedy, P. (1993). *Preparing for the Twenty-First Century.* New York: Random House.

Lawton, J.H., May, R.M. (1995). *Extinction Rates.* Oxford University Press.

Lee, M.P. (2008). A Review of the Theories of Corporate Social Responsibility: Its Evolutionary Path and the Road Ahead. *Int. J. Manag. Rev, 10*, 53-73. [http://dx.doi.org/10.1111/j.1468-2370.2007.00226.x]

Lehman, C. (1983). *Stalemate in Corporate Social Responsibility Research.*

Lindblom, C.K. (1994). The Implications of Organizational Legitimacy for Corporate Social Performance and Disclosure. *Critical Perspectives on Accounting Conference.* New York.

Li, Liqing (2006). Corporate Social Responsibility Assessment Theory and Empirical Research: from the Example of Hunan Province. *South Economics, 1.*

Li, S., Zhu, D., Chen, Z. (2007). *Externality Theories and the Internalization Research Review. Academic Research* China Academic Journal Website.

Locke, J. (2003). *Two Treatises of Government and A Letter Concerning Toleration.* Yale University Press.

Lubchenco, J. (1998). Entering the Century of the Environment: A New Social Contract for Science. *Science, 279*, 491-497.

Lu, C. (2009). Pollution Property Transaction. *Financial Living Page of Liao Ning Province Financial and Scientific Institute, Liao Ning Finance Society, 11*, 4.

Mark, D. (2000). Sustainability and Sustainable development. *Sustainability: the Corporate Challenge of the 21st Century.* Australia: Griffin Press.

Marshall, A. Principles of Economics(reprint). New York: Prometheus Books. 1997.

McGuire, J.W. (1963). *Business and Society.* New York: McGraw-Hill.

McMichael, A.J. (1993). *Planetary Overload: Global Environmental Change and the Health of the Species.* Cambridge University Press.

McNeely, J.A. (1997). *Conservation and the Future: Trends and Options Toward the Year 2025.*

Murphy, D.F., Bendell, J. (1997). *In the Company of Partners: Business, Environmental Groups and Sustainable Development Post-Rio.* UK: Polity Press.

Nasi, J. (1995). What is Stakeholder Thinking?*A Snapshot of a Social Theory of the Firm. Understanding Stakeholder Thinking* (pp. 19-32). Helsinki: LSR-Publications.

O'Donovan, G. (2002). Environmental Disclosures in the Annual Report, Extending the Applicability and Predictive Power of Legitimacy Theory. *Accounting, Auditing and Accountability Journal, 15*(3), 344-371. [http://dx.doi.org/10.1108/09513570210435870]

Preston, L.E., Post, J.E. (1975). *Private Management and Public Policy: The Principle of Public Responsibility.* Englewood Cliffs, NJ: Prentice Hall.

Pigou, A.C. (1920). *The Economics of Welfare.* London: Macmillan and Co.

Preston, L.E. (1975). Corporation and Society: the Search for a Paradigm. *Journal of Economic Literature, 13*, 434-453.

Rawls, J. (1971). *A Theory of Justice.* Harvard University Press.

Rawls, J. (1993). *Political Liberalism.* Columbia University Press.

Ren, Y., Shen, D., Dong, Y. (2005). *Corporate Ecological Culture Research.* Dalian: Dongbei Financial and Economic University Press.

Rowland, F.S. (1989). Chlorofluorocarbons and the depletion of stratospheric ozone. *American Scientist, 77*(36)

Schaltegger, S., Burritt, R., Petersen, H. (2003). *An Introduction to Corporate Environmental Management.* UK: Greenleaf Publishing Limited.

Schein, E.H. (1996). Three Cultures of Management: The Key to Organizational Learning. *Sloan Management Review,* 9-19.

Schmidheiny, S. (1992). The Business Logic of Sustainable Development. *Columbia Journal of World Business, 27*, 19-23.

Schulze, E.D., Mooney, H.A. (1994). *Biodiversity and Ecosystem Function.* New York: Springer.

Sethi, S.P. (1975). Dimensions of Corporate Social Performance: An Analytic Framework. *California Management Review, 8*, 58-64.
[http://dx.doi.org/10.2307/41162149]

Stark, A. (1994). *What's the Matter with Business Ethics?*.www.chass.utoronto.ca/~jheath/BEwithout.pdf

Steiner, G.A. (1971). *Business and Society.* New York: Random House.

Walton, C.C. (1967). *Corporate Social Responsibilities.* Belmont, CA: Wadsworths.

Wartick, S.L., Cochran, P.L. (1985). The Evolution of the Corporate Social Performance Model. *Academy of Management Review, 10*, 758-769.
[http://dx.doi.org/10.5465/amr.1985.4279099]

Wei, X. (2005). Environmental Right as Human Right and Sustainability Development. *Philosophy Research, 11*, 8-13.

WCED (World Commission on Environment and Development). Our Common Future (The Brundtland Report). Oxford: Oxford University Press. 1987.

Wilmshurst, D.W., Frost, G.R. (2000). Corporate Environmental Reporting a Test of Legitimacy Theory. *Accounting, Auditing and Accountability Journal, 13*(1), 10-26.
[http://dx.doi.org/10.1108/09513570010316126]

Wood, D.J. (1991). Corporate Social Performance Revisited. *Academy of Management Review, 16*, 691-718.
[http://dx.doi.org/10.5465/amr.1991.4279616]

Woodward, D.G., Edwards, P., Birkin, F. (1996). Organizational Legitimacy and Stakeholder Information Provision. *British Journal of Management, 7*, 329-347.
[http://dx.doi.org/10.1111/j.1467-8551.1996.tb00123.x]

World Resources Institute. World Resources 1994-95: A Guide to the Global Environment. Report in collaboration with the UN Environment Program and the UNDP. Oxford University Press, New York & Oxford.

Worldwatch Institute. (1994). *State of the World* (p. 38). New York: W. W. Norton.

Wu, J. (2005). On the Corporate Environmental Responsibility. *China Ocean Univerity Ph.D Dissertation.*

Yan, Ma (2003). Corporate Environmental Protection Responsibility. *Modern Law Science, 25*(5)

Ying, F. On the Corporate Environmental Responsibility and Achievement Mechanism—from the Perspective of Cleaner Production Law. Fuzhou 26 University Postgraduate Degree Thesis 2005.

Yu, Xunda (2006). *Corporate Social Responsibility in the Public View.* Zhejiang Social Science, Vol.5.

Yong, Zhou (2004). The Concept and Value of Corporate Social Responsibility under the Market Economic Condition. *Hubei University Journal (Social Sciences edition), 5.*

Zhu, D. C mode: China's Development in the Condition of Natural Resources Scarcity. Fudan University Environmental Economic Research Center, The Sixth Annual Meeting and Symposium, Fudan University, Dec. 18th 2005.

Zhu, D., Yuan, Z. (2006). Circular Economy: An In-depth Study from Three Aspects. *Soc. Sci. (Kans.),* (4), 46.

CHAPTER 3

Low Carbon Economy: Climate Change and Corporate Environmental Responsibility

Abstract: The earth's climate are being changed unprecedentedly by the greenhouse gases. Since UK firstly proposed the idea of low carbon economy, various interpretations have been given by international and national scholars concerning the low carbon economy definition, achievement possibilities and market values, *etc*. Although they are different in the perspectives and concepts, one thing is the same: clean, healthy and sustainable development can be realized by technology and system innovation to minimize the green gas emission and maximize the economic and social growth. The development of low carbon economy aims to mitigate climate change. In the context of low carbon economy, enterprises are facing with influences of international policy, investor, national regulatory, customer, peers, sub-sector and supply chain. Shrewd companies recognize that opportunity is approaching and they are moving to get reward. They have learned to cut their contribution in global warming and act faster than regulators and become competitive leaders. They developed new capabilities which mainly refer to organisational learning and approaches for continuous improvement and innovation. Consequent responsible brand image promotes them to prosper. China's rapid economic development causes high demand for fast growth in energy production and consumption. Currently, China's GHG emission now is world Number 2. In process of developing low carbon economy in China, the main corporate environmental responsibilities—cultivating low carbon industry, establishing the supporting system, accelerating the related technology development and application, promoting clean manufacturing—need to be taken.

Keywords: Benefits, Climate change, Corporate environmental responsibility (CER), Low carbon economy, Opportunity, Pressure, Response.

Business got their profits with little consideration for their environmental consequences for years. Actually every business sector in every country had responsibility for consuming large amounts of resources. The climate change is mainly effected by firms and companies who process raw materials and contribute great negative externalities. The global warming and extreme weather was the trigger for low carbon economy. This has become a consensus of the entire human race, including developed countries and developing countries. In this chapter, we will begin by discussing the notion of low carbon economy and different perspec-

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tives on it. Then we will outline the pressures threatening business today. The role of government and public policies are underlined in effecting important change. Also we will explore the opportunities and benefits that low carbon economy brings to business. Lastly we will focus on Chinese context in which the current resource condition, requirement for resources product, pressure of emission reduction is analyzed and strategic target is proposed.

1. CLIMATE CHANGE AND LOW CARBON ECONOMY

The greenhouse gases in the atmosphere are accelerating the earth's climate change at an unprecedented rate in history. The year 2005 was the warmest on record, and the ten warmest years have all taken place since 1980. Ice in Greenland, the Arctic, and the Antarctic is melting, and almost all of the world's glaciers are shrinking. And the shrinking polar ice caps aren't the only apparent consequence: droughts, storms, and other weather-related disasters—for example, contagions, whose spread are correlated with temperature and moisture rates—are growing more serious and more frequent.

Most climate models predict a three-to-eight-degree rise in global average temperatures, if atmospheric concentrations of greenhouse gases attain twice preindustrial levels. Something that will happen by 2050, if current trends continue. All of those models indicate some risk (between 5% and 15%) that the temperature will rise significantly more than that. In addition, there is a risk of unknown magnitude that positive feedback mechanisms in the climate system—for instance, the release of methane from melting permafrost in northern Canada, and it could contribute to global warming and further melting of the permafrost—will cause sudden, nonlinear acceleration in warming (Johathan and Fred, 2007:128).

If current emission trends continue or even if emission reduction commitments currently made by nations are successfully achieved, several studies predict that temperatures will exceed 2°C average global warming by 2100 (Hansen *et al*., 2006; Anderson and Bows, 2008; Parry, Lowe and Hanson, 2008; Meinshausen *et al*., 2009; Rogelj *et al*., 2009). This level of warming draws greater attention of many scientists and over 100 nations (IPCC, 2007a), including the G8 nations (G8, 2009), to represent "dangerous interference with the climate system" as summarized in the United Nations Framework Convention on Climate Change.

In order to stop the accumulation of greenhouse gases in the earth's atmosphere, global emissions would have to stop growing in this decade and be reduced by an astonishing 60% from today's levels to 2050. And the target of low carbon economy is designed to mitigate climate change.

2. VIEWS ON LOW CARBON ECONOMY

In 2003, low carbon economy primarily emerged in British energy white paper, "Our energy's future: creating low-carbon economy". It thinks "low-carbon economy is through the less natural resource consuming and less environmental pollution, and more economic output. Low-carbon economy is an approach and chance to create a higher standard of living and better quality of life. It also creates opportunities for the development, application and output of advanced technology, furthermore, it can create new business opportunities and more employment opportunities."

Subsequently, Johnston (*et al.*, 2005) studied the technology feasibility of carbon dioxide emission in the badly decreasing British houses and they thought it was possible to use the current technology to make 80% emission at 1990 level in the middle of this century. Treffers (*et al.*, 2005) discussed the possibility of 80% GHG emission on the 1990 basis in Germany by 2050. They thought robust economic growth and GHG emission reduction could be achieved by adopting effective policy measures. Kawase (*et al.*, 2006) reviewed long period stable climate status, and concluded the emission were due to 3 factors: carbon dioxide intensity, energy efficiency and economic activities. They showed that the changing speed of the general energy intensity, the decreasing speed of carbon dioxide intensity must be 2-3 times faster than that in the previous 40 years. Shimada (*et al.*, 2007) constructed a method to describe the suburban long range low carbon development and applied it to the Shiga area of Japan. The report "Profit: Low Carbon Economy Growth" was made by Climate Group. It introduced the idea of low carbon economy, reviewed the market development and analysed the benefit of low carbon economy. It indicated that low carbon economy could create higher investment reward rate, greatly increase the production, decrease production liability, improve product quality and working environment and encourage staff morale. It had excellent potential in the employment creation and its growth speed would be faster than other economic patterns. Professor Jonatan and Ans (2009) explained the most relevant regulatory developments all over the world. They focused the voluntary initiatives taken by companies, discussed the factors that have influenced corporate activities on climate change and examined compensatory approaches, particularly carbon trading, and other companies' activities in various emerging carbon markets with different characteristics. They analysed how corporate activities, concerning climate change, built on a company's existing capabilities in of its operations. And they thought it might help create new sources of competitive advantage and thus facilitate the company's profitability, survival and growth.

Chinese scholar Zhuang Guiyang (2005) thought the target of low carbon

economy was to mitigate climate change and support human sustainable development; the key was the energy technology innovation and system innovation; and the essence was energy efficiency and clean energy structure. In other words, an energy revolution should be promoted by technology innovation and policy measures to set up an economic development pattern with less greenhouse emission and the climate change reduction. Fu Yun (*et al.*, 2008) analyzed the development orientation, pattern and method of low carbon economy from macro-level, meso-level and micro level. It meant that the low carbon development direction, energy saving and emission reduction pattern and carbon neutral method should be adopted. They proposed some measures for developing low carbon economy in China: save energy and improve energy efficiency; produce low carbon fossil fuels and renewable energy; create carbon fund and encourage research and develop ow carbon technologies; establish national carbon trade mechanism. The report "Toward a Low Carbon Development: China and the World—Suggestions of Chinese Economists" systematically analysed the effectiveness of various emission reduction mechanisms such as 'carbon tax' and 'carbon trade' under different conditions on the basis of "emissions per capita consumption of historical accumulation" to calculate emission reduction responsibility of each country. It suggested China, as a developing country, should adopt which strategies and measures in this aspect. Also it pointed out the deficiencies in the current international emission reduction cooperation and put forward "Inter-country Joint Mitigation Plan" as the third channel of international cooperation emission reduction. It would induce the necessary transfer of fund and technology from developed countries and improve more achievement of emission reduction among developed countries and developing countries with the aim to prevent climate change in collaboration. Feng Jianzhong (2010) used the theories and methods of history to make clear how the EU energy strategy moved from pure supply safety to energy safety, economic safety and ecological safety and how these 3 targets interaction grow into low carbon economy. From this historical evolution process, the interaction relationship between EU energy strategy and Europe unity was discussed in an inclusive and systematic manner.

To sum up, since UK proposed the concept of low carbon economy, individual understanding and explanations have been provided by international and national scholars in the aspects of low carbon economy concept, achievement possibilities and market values, *etc*. Although they are different in the perspectives and concepts, one connotation is similar: the economic and social clean and sustainable development can be realized by technology innovation and system innovation to minimize the green gas emission without influencing the economic and social progress.

3. MOTIVATIONS OF ENTERPRISES IN LOW CARBON ECONOMY

Various pressures, which come from the aspects of international policy, investor, national regulatory, customer, peers, sub-sector and supply chain, constitute the complex low carbon economy system of enterprises.

3.1. EU Low Carbon Policy Evolution

Since 1970s, EU countries came to realize environmental problems have become the top priority of economy development. They regarded low carbon economy as the new industrial revolution and adopted a series of powerful measures to promote low carbon industry development. They acted as the pioneers to cope with climate change in the whole world, expecting to drive EU countries transformed with energy-efficient and low emission economic model. The series of policies and measures issued by EU obtained active echoes from all over the world, including U.S. and China. Low carbon industry has become the hottest emerging industry in the world.

In 1973, EU issued "The Environmental Action Plan", which became the action outline for EU in environmental management. It settled the principles and objectives of EU environmental protection policies in one year and proposed a series of measures to protect the environment, enclosed with detailed timetable and instructions. The EU countries are required to introduce it into national legal provisions according to the designed objectives and measures. This plan defined and designed the medium and long strategy for EU in environmental protection at that time. In 1987, the "Single European Documents" was promulgated. The special regulations on the environmental protection was recorded in the treaty for the first time. This provided a clear legal basis for EU community to adopt environmental measures.

In 1991, the treaty of the European Union was signed. The second treaty pointed out that one of the EU's basic target was to promote the balanced and coordinated development of economic activities and sustainable growth with no inflation. And the environmental policies were used as the official policy in Europe. In 1994, the cohesion funds were established to provide financial support for the environmental action of EU countries. The environmental interest got the attention in EU action at that time and environmental protection became a foundation of EU community. In 1993, EU was established. To promote sustainable development and protect the environment was listed as one of the objective of EU in the revised EU treaty. And the mission and power in environmental protection was further clarified. According to the treaty, environmental protection should be included in the other policies making and implementation. Therefore, environmental protection was taken into the

consideration in various policies, concerning common market establishment and operation in EU.

In 1997, the Amsterdam treaty integrated sustainable development as the priorities and basic mission of EU. This made environment and development included in the EU basic legislation and enable it to be the legal basis for comprehensive decision making on environment and development. In December of the same year, the Kyoto Protocol was reached by the Japan's third conference of the parties. The core content was during 2008-2012 the developed countries should reduce 6 kinds of greenhouse gas emissions by more than 5% on average. And EU's target was to reduce 8% by 2012 with the 1990 benchmark. At the end of 1998, the EU environmental ministers held a meeting and jointly issued the EU Strategy of Climate Change. The document showed the basic position, attitude and opinions of EU toward the Kyoto Protocol, that is, to control the greenhouse gases emissions and curb global warming.

In 2000, EU launched the first European Climate Change Program (ECCP I). The framework enabled EU countries and stakeholders to adopt a series of cost-effective emission reduction measures with the focus on the energy, transportation and industrial sectors. For example, EU countries were encouraged to use the reusable energy to produce electricity, improve the energy efficiency of building industry and promote the wide use of biofuels. The aim was to identify and develop the EU strategy for the implementation of the Kyoto Protocol. And this became the policy preparation for commitment for the Kyoto Protocol promise.

On January 24, 2001, EU signed the "Environment 2010: Our Future, Our Choice". For the first time, EU realized the need to deal with the long term goals of emission reduction, which is set by the governments. In the same year, the United States and Australia pulled out of the Kyoto Protocol, and the world negotiations on climate change were deadlocked. EU seized the moment and used all kinds of diplomacy to motivate other countries to participate in the support of the Kyoto Protocol. And it showed the flexible attitude in the negotiations with China in the theme of developing countries. And it contributed to the Bonn Political Agreement, which was signed for financial support in coping with climate change and developing low carbon economy and establishing climate change adaption found in developing countries.

In addition, EU actively promoted the signing of the Marrakesh Agreement, which provided a fast track for smaller projects of emission reduction. This not only helped the environmental protection in developing countries, but also provided the calculation method of carbon sink and allowed the use of upper limit of the amount of carbon sinks. Thus it established the dominant position of EU in

the environmental protection worldwide. In 2002, EU passed the sixth Environmental Action Plan to include the Climate Change issue in the context of sustainable development strategies and put it on the priority list of environmental protection.

In 2003, Our Energy Future, a white paper of UK, was issued. For the first time it put forward the concept of low carbon economy. Low carbon economy was supposed to get more economic output through less resource consumption and less environment pollution. It was a pathway and opportunity to create higher living standard and better living quality. It created opportunities for the development, application and output of advanced technology and also created new business opportunities.

On January 1, 2005, EU officially launched the greenhouse gas emission trading system to reduce the low carbon cost with the help of the market. The transaction involves power generation, heating, refining, metal smelting and processing, paper and other energy intensive enterprises. Each member state made a National Allocation Plan of carbon dioxide emissions at each stage of the transaction, assigning emission rights to companies and clarifying specific targets for reducing emissions. This became the basis and pathway to achieve the Kyoto Protocol targets and played an important role in the long term strategy of climate change throughout Europe. The system was the first international emissions trading market and was the largest trading system in the world as well as the main pillar of the fast growing global carbon trading market. In October, the environment, public health and food safety committee of European parliament passed the Winning Campaign in Response to Climate Change, which established the innovation and other measures to expand EU in the global participation through leadership. It intended to control the global warming effect within 2°C, based on the current industrialization level. The bill was considered to be the idea of climate change policy and international negotiations strategy of EU after 2012. EU also launches the second European Climate Change Program (ECCP II), incorporating aviation into EU emission trading system and legislation to reduce the carbon dioxide emissions of new cars. It aimed to the most effective way to reduce greenhouse gases in the first commitment period of the Kyoto Protocol. This promoted the implementation of Kyoto Protocol provisions and measures.

In March 2006, the EU commission published the Green Paper of EU Energy Policy. It formulated the EU common energy policy, strengthened the energy market regulation, opened the energy market of the member states, encouraged the sustainable utilization of energy, strengthened the research and development of clean and renewable energy and set up the international mechanism of energy supply security. In October of the same year, the EU commission required in the

Action Plan of Energy Efficiency to improve the efficiency of energy production and reduce the huge energy consumption of buildings, transportation materials and machine production. Meanwhile, it made new compulsory standards requirement and promoted the energy saving products.

In January 2007, the EU commission passed a new legislation to revise the Fuel Quality Instruction and formulate tougher standards for fuel production and transportation departments in terms of fuel production. In March of the same year, it passed a package of EU energy plan, that is, the integration of energy and climate decision. Through adopting the "20-20-20" plan, namely by 2020, the emissions of greenhouse gases will be decreased at least 20% on the 1990 basis, the disposable energy consumption, such as oil, coal, gas, will be reduced by 20%, the proportion of renewable energy to the total energy consumption will be increased 20%. At the same time, the proportion of biofuels to the total energy consumption will be increased 10%, and by 2050 the greenhouse gas emission will be reduced 60%-80% comparing with 1990. This plan aimed to control greenhouse gas emissions and win the power of initiative of EU in the global climate change action after 2012. At the same time, it was the milestone of EU in terms of climate change policy.

On January 23, 2008, the EU commission proposed the new legislation of Package of Climate Action and Renewable Energy to increase control of greenhouse gases and develop the renewable energy and scheme of Binding Targets. This post-Kyoto international climate regime became the important foundation for the world to pass the integration of climate and energy policy and mitigate the climate change.

In February, the EU commission in Brussels put forward the Strategic Plan of European Union Energy Technology, increasing research investment measures to cope with climate change, increasing investment in energy industry, establishing scientific research union, encouraging the promotion of low carbon energy technology, such as wind, solar and biological technology. This will promote the future sustainable energy use mechanism of EU. The Economic Recovery Plan in December used large quantity of fund to finance low-carbon project, some was use for carbon capture and storage projects, some was used for electricity capital network with assistance renewable energy to enter the European grid, and some was used for the offshore wind energy projects in developing the North Sea and the Baltic Sea.

In March 2009, the EU commission announced that it would invest a total of 105 billion euros as the low carbon fund to support the development of Green Economy in EU by the end of 2013. This greatly improved the EU development

and innovation in terms of low carbon economic technology, promoted the economic growth of EU, expanded employment and enabled the EU low carbon economic development to be the world leader. 54 billion euros of these payment would be used in the implementation of EU environmental protection regulations, 28 billion euros to improve water quality and waste treatment. As the same time, it encouraged to create new manufacturing technology, new energy consumption of building and building materials, green car and intelligent transportation system through public-private partnership of science and technology research and development. On November 26, 2009, the European Steel Union suggested the policy makers of the Copenhagen Climate Change Conference to hold an equal attitude toward developed countries and emerging markets in the global emission issue. It said the response to climate change was hard to achieve, if some big industries, including China iron and steel, continued without the agreement restriction (Jiang, 2010).

Global climate change has become a widely salient issue appealing to voters all over the world since the inception of the 1997 Kyoto Protocol (Bonardi and Keim, 2005), especially in 2005 to 2007. In the post-Kyoto period, especially in 1999, 2000, 2001 and 2005, the international policy context experienced failures and refusals due to different characteristics in different countries. Even though many countries have ratified the Kyoto Protocol, it is still not evident in most cases how national governments intend to meet their targets (Jonatan and Ans, 2009:31). Therefore, there is ample room or opportunity, and also necessity for companies to go beyond the policy and voluntarily take actions to influence the current measures of climate change at the national and international levels.

3.2. Investors Demand

International government regulators aren't the only one monitoring individual companies for deficient climate-related practices. Evidence suggests that investors expect to receive competitive returns from social investments (Business Week, 1998). Ann and Carroll (2008:74) assert that there really are investors in the true world who take the social performance issue quite seriously. According to Johathan and Fred (2007:129), big investors begin to demand more disclosure from companies. For example, the Carbon Disclosure Project, a coalition of institutional investors representing more than $31 trillion in assets, annually requests information from large multinational companies about their climate-risk arrangement. Its most recent report, released in 2006, showed a remarkable increase both in the awareness of climate change on the part of the respondents and in the best practices developed to manage exposure to climate change.

Similarly, investor coalitions are setting shareholder resolutions requesting more

climate risk disclosure from companies. More than two dozen climate-related resolutions were filled with companies from 2004 to 2005, tripled the number from 2000 to 2001. U.S. companies faced growing pressure from institutional investors who asked for disclosure requirements on climate risks (Monks *et al.*, 2004).

Meg Voorhes, director of the Investor Responsibility Research Center, says that climate change has emerged in the last three years as the most widespread concern. Some of the nation's largest investors are among those setting resolutions, which include pension fund managers on behalf of public employees in Connecticut, New York state, Maine, and New York City (Barnaby, 2004).

After the *Exxon Valdez* oil spill, several environmental, labor, and social investor groups formed an organization called CERES and developed a set of 10 policy statements called the "Valdez Principle". These principles have been advanced as models for business to express and practise environmental sensitivity. For example, the 4th principle declares that we will save energy and improve energy efficiency of our internal operations and of the goods and services we sell; we will try our best to use environmentally safe and sustainable energy sources. The last principle promises that we will make an annual self-evaluation of our progress in implementing these principles; we will facilitate the timely creation of generally accepted environmental audit procedures; we will annually accomplish the report, which will be made available to the public. Companies that have endorsed the principles comprise American Airlines, Bank of America, Coca-Cola, General Motors, Polaroid Corporation and Sunoco (http://www.ceres.org).

3.3. National Regulation

In November 2009 Climate Change Act of UK became the first piece of domestic legislation anywhere in the world to create binding targets for lowering emissions of greenhouse gases. It also created the Climate Change Committee, an independent institution reporting to Parliament to monitor and advise the progress. The government has also set up a low-carbon growth strategy and a consultation on heat and energy savings (Wilf, 2009:77). This will restrict these companies who do not concern energy productivity, the amount of output achieved from each unit of energy consumed.

In the United States, which withdrew from the Kyoto Protocol, various regional, state, and local government policies affect companies cumulatively. Seven north eastern states have adopted an agreement to cap carbon emissions from utilities and establish a carbon trading scheme. California has enacted regulations requiring that from 2008 to 2016, greenhouse gas emissions from new cars be decreased 30% and has passed legislation to decrease total emission to 1990

levels by 2020. A 2007 executive order also requires a decrement in the carbon content in motor fuels. Twenty states require utilities to obtain a percentage of the power they sell from renewable sources, and more than 218 U.S. cities have adopted programs to cut down emissions.

And companies that produce significant carbon emissions will face the threat of lawsuits similar to those common in the tobacco, pharmaceutical, and asbestos industries. For instance, in an unprecedented case spearheaded by the former New York attorney general Eliot Spitzer and currently being considered by the U.S. Second Circuit Court of Appeals, eight states and New York City have sued five of America's largest power companies, demanding that they reduce carbon emissions. In a federal district court case in Mississippi, plaintiffs are suing oil and coal companies for greenhouse gas emissions, arguing that they contributed to the violence of Hurricane Katrina. The claims in that case include unjust enrichment, civil intrigue (against the American Petroleum Institute), public and private injury, crime, oversight, and dishonest misrepresentation. Companies that don't sufficiently address the issue of climate change also can create personal liabilities for directors and officers who become vulnerable to shareholder-related prosecution (Johathan and Fred, 2007:135).

3.4. Customer Expectation

Today's consumers are better informed and more in control of corporate environmental responsibility. And customers can do more for the environment without losing their money. A company in Lincolnshire has brought forward free-range respectful eggs which are laid on farms powered by carbon-neutral, renewable energy source such as wind turbines and solar panels. These methods are said to reduce the amounts of damaging carbon dioxide released into the atmosphere and help to impede the acceleration of global warming and climate change (Food and Drink Technology, 2007). It is no doubt that these low carbon eggs laid by happy hens will enable environment and health conscious consumers to make a better choice.

According to Dickinson, head of research at logistics giant DHL, two-thirds of DHL's major customers already have concrete reduction targets and expect DHL to contribute to these goals (Facilities management Energy, 2008:16).

A new Deutsche Post DHL (DP-DHL) study shows that 84 percent of consumers in China, India, Singapore and Malaysia will accept a higher price for green products, while only 50 percent in Western industrialized nations will do. And the sense of urgency concerning climate change is also strongest in Asia, particularly in India and China, where 70 percent of consumers rank it as one of the world's most serious issues (Air Cargo World, 2010:2).

Companies also face judgement in the court of public opinion, where they can be found guilty of selling or implementing products, processes, or practices that have a negative impact on the climate. The potential for consumer or shareholder boycott is particularly high in environmentally sensitive markets or in competitive sectors where brand loyalty is very significant for corporate value. In a recent study analysing the impact of climate change on brand value, The Carbon Trust, an independent consultancy funded by the UK government, found that in some sectors the value of a company's brand could indeed be at risk due to negative perceptions related to climate change (Johathan and Fred, 2007:136).

3.5. Competition among Peers

Table **3.1** shows that many chemical companies disclosed partial details about their carbon emissions activities (Alex and Robert, 2008:23). However, some companies participated but produced no public result and some of them declined to do so.

Table 3.1. Chemical companies leading on emission report*.

Company	**M.T. Equivalent of CO_2 Emissions**
Air Liquid	15,299,000
Air Products	11,000,000
Akzo Nobel	5,200,000
Altanna	118,514
Ashland	730,000
AstraZeneca	524,000
BASF	24,986,816
Bayer	8,000,000
Chevron	61,834,134
Dow Chemical	37,700,000
DSM	9,900,000
Dupont	12,100,000
Eni	63,050,000
ExxonMobil	158,800,000
Monsanto	1,901,000
Shell	98,000,000
Syngenta	748,319
Total	57,800,000
Lanxess	Participated but results not public

(Table 3.1) contd.....

Company	M.T. Equivalent of CO_2 Emissions
Mitsui Chemical	Participated but results not English
Rhodia	Participated but results not public

Source: Carbon Disclosure Project (London) and *CW* research.

* Carbon dioxide (CO_2) equivalent emissions for companies in 2006. Figures relate to direct CO_2 emissions as well as indirect emissions such as those derived from consuming electricity. They exclude CO_2 emissions relating to raw materials. The following companies declined to participate in Carbon Disclosure Project (CDP) Emission survey: Agrium; Archer Midland Daniels; Asahi Chemical; Evonik (declined to participate from 2005); Formosa; Mitsubishi Chemical; Reliance Industries; Shin Etsu; Sumitomo Chemical.

Those multinational chemical firms with the best environmental performance and environmental reporting in their sector increasingly are rewarded with a higher share price, says Kees Cools, professor of corporate finance at the University of Croningen in Netherlands. Equity analysts are coming to realize the implementation of sustainable practices as a determinant of shareholder value, Kees says. "In particular, companies that lag behind with their CSR practice and GHG emissions control have got punished in the stock market," He says (Kees, 2007:28).

3.6. Sub-sector and Supply Chain Pressure

There is general consensus that tourism, as a global economic sector interconnected with many other sectors such as accommodation, retail, and aviation, is an important contributor to climate change and should make great effort to reduce GHG emissions and address the climate change. The research commissioned by United Nations World Tourism Organization (UNWTO), United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) (UNWTO-UNEP-WMO, 2008) made an estimation that global tourism-related emissions of CO_2 was at roughly 5% of total global emissions in 2005 (with an estimated range of 3.9% to 6.0%). Most of these emissions are produced by the transport of tourists and, in particular, air travel (as is shown in Table **3.2**).

Table 3.2. Distribution of emissions from tourism by sub-sector.

Sub-sectors	2005		2035	
	CO_2(Mt)	%	CO_2(Mt)	%
Accommodation	274	21%	739	24%
Air transport	515	40%	1631	53%
Car transport	420	32%	456	15%
Other transport	45	3%	37	1%
Activities	48	4%	195	6%

(Table 3.2) contd.....

Sub-sectors	2005		2035	
	CO_2(Mt)	%	CO_2(Mt)	%
Total	1,307	100%	3,059	100%
Total world	16,400			
Tourism contribution	5%			

Source: UNWTO-UNEP-WMO, 2008.

Apart from 2 sub-sectors, the emissions from 3 sub-sectors of air transport, accommodation and activities are expected to increase substantially in 2035. The total emission from tourism in 2035 will be more than 2 times in 2005. If tourism does not change its develop mode, it will become a key source of GHG emissions in the world seeking to decarbonize all other sectors of the economy (Daniel *et al.*, 2010:394).

A company that has outsourced many non-core activities depends on outsiders for many of its critical resources and the supply-chain risk will also be demanded for energy efficiency because of higher energy prices (Jonatan and Ans, 2009:146). The vulnerability of suppliers could also lead to higher energy costs as suppliers pass along increasing carbon related costs to their customers. Auto manufacturing, for instance, relies heavily on suppliers of plastics, rubber, glass, aluminium, and steel, all of whom are likely to be seriously affected by emissions regulations or—as in the case of aluminium manufacturing, a big consumer of energy—by regulation on their supplier's suppliers (Johathan and Fred, 2007:133) .

4. OPPORTUNITIES AND BENEFITS OF LOW CARBON RESPONSIBILITY

Exploring low carbon economy is not only the approach to perform Corporate Environmental Responsibility, more significantly, it brings increasing corporate opportunities as well, so CSR and corporate benefits are both gained. The following three perspectives can be elaborated.

4.1. Opportunities to Improve Corporate Capabilities

To what extent companies are able to take advantages from climate change depends on their flexibility in expanding new capabilities which mainly refer to organisational learning and approaches for continuous improvement and innovation (Sharma and Vredenburg, 1998; Hart 1995).

On the one hand, a company has to make clear how the core business activities are affected and which strategic adjustments are required to manage these impacts optimally. Therefore the availability and type of internal climate expertise is very

crucial (Kolk and Levy, 2004). On the other hand, as many companies are still short of climate expertise, they choose to acquire climate-specific knowledge from outside and learn from external partners. There are many examples of MultiNational Corporation (MNCs) which have links with universities and research institutes: Exxon Mobil funds in the Global Climate and Energy Project of Stanford University; Suncor invests a Clean Energy Laboratory of the University of British Colombia; and Chevron is co-funding the Massachusetts Institute of Technology Joint Program on the Science and Policy for Global Climate Change. Furthermore, Rio Tinto participates in research efforts of the US-based Electric Power Research Institute; and BP, together with Ford, has a partnership with Princeton University, called the Carbon Mitigation Initiative, which aims at "resolving the fundamental scientific, environmental, and technological issues that are likely to influence public acceptance of any proposed solution" (Jonatan and Ans, 2009:144).

It is when companies are able to constantly prevent emissions that they can achieve additional reductions. Innovation is an important underlying driver to the capabilities of both successive progress on emission reduction and production efficiency. As Florida (1996:81) explains, environmental improvements, to some extent, flow from broader corporate efforts to innovating and implementing efficient manufacturing systems and practices. For example, a technology for converting coal into energy (IGCC, or Integrated Gasification Combined Cycle), while currently more expensive than traditional methods used in pulverized-coal plants, can reduce aggregate carbon emissions through better efficiency and possibly carbon dioxide capture and storage. In continuous technology improvement, IGCC would cut down the significant costs that coal-fired plants would face under more rigorous emission standards.

4.2. Benefits of Early Movement

Global warming is a problem with uncertain characteristics. And in a world where even TV weather forecasters can't accurately predict rain or sun, business leaders might be forgiven for tending to more immediate problems and leaving climate-change actions to the next generation. But the uncertainty is no excuse for no action even with any other risks. Most scientists agree that we will face serious consequences if we do not tackle the problem (Kimberly and Forest, 2007:29).

"The Pew Center's Business Environmental Leadership Council" (BELC), held the belief that business engagement is critical for developing efficient and effective solutions to the climate change. Companies take early action on climate strategies and policies will gain sustained competitive advantage over their peers (www.pewclimate.org/companies_leading_the_way_belc). Usually the first-

mover advantage is based on deployment of an up to date and climate-friendly technology.

Du Pont is one of the early movers for climate change. It prides itself on having achieved cost savings through an emission reduction project. This chemical company claims that even though the costs to achieve emission reductions were more than US$50 million, cost savings amounted to more than US$3 billion between 1990 and 2005 (Jonatan and Ans 2009:72).

The pioneering corporations that have made reinvestments in natural capital are starting to see some exciting rewards. The independent power producer AES, for example, has long pursued a policy of planting trees to compensate the carbon emissions of its power plants. That ethical behavior, once thought quixotic, now becomes a smart investment, because a dozen brokers are now starting to create markets in carbon reduction. Similarly, certification by the Forest Stewardship Council of certain sustainably grown and harvested products has returned Collins Pine the extra profit margins that enabled its U.S. manufacturing operations to survive in the brutal competition. However, most companies still do not realize that a vibrant ecological web will support their survival and their business success. It is not just a social benefit to enrich natural capital—it is vital to the long life of every company (Amory *et al.*, L., 2007:89).

Low carbon economy closely connects enterprise environmental responsibility. The earlier action taken by enterprises, the more competitive they will be. In other words, from the resource-based perspective, corporation should comply with the government regulations, make innovations on clean energy and achieve the competitiveness of high energy efficiency.

4.3. Advantages of Brand Effect

It is known to all that a company can benefit from its brand. Corporations can build up customer loyalty and governmental support by good brand image. Currently, it is easier for low-carbon-economy corporations to establish good public image compared to those with high emission releasing and resources dissipation. So they can expand their market and capture the share so as to establish solid foundation for corporate benefit and growth. Regarding the direct effects of low carbon economy on brand marketing, in addition to possible carbon tax discussed again and again by officials, the changes of global consumption values should be considered by all brand managers. With low carbon economy tendency, some consumption values usually proclaimed in traditional brand marketing, such as bragging about luxury and style, are likely to be embarrassed and put under the public magnifier of reducing energy and releasing, just like the market poisonous drugs. Because the public come to know consumption can’t be

so casual to just satisfy individuals. Unreasonable and excessive consumption will leave too many troubles to offsprings. Therefore, "responsible consumption" will increasingly become global acceptable consumption styles, which will influence all products, from luxury to fast moving consumer goods, without any exception. For example, the strong consciousness of reducing dissipation is pyramidally valued in UK. An investigation result at the end of 2008 shows over two-third British people prefer to purchase the products from companies who actively participate reducing energy and dissipation. The first thing British oil company BP did after stepping out of the Global Climate Coalition in 1997 was to establish a target to cut down internal emissions by 10 percent by 2010 (other steps were setting up partnerships with Environmental Defense and the Pew Center for Global Climate Change) (Levy and Kolk, 2002). The company emphasized that their target was tougher than those of most industrialised countries under the Kyoto Protocol. The BP case on climate change has become one of the most widely-cited best practices in corporate climate change initiatives, and thereby the leadership on the issue has greatly improved BP reputation.

In recent years, American Hollywood film stars greatly pursue gas-electricity mixed cars. This represent the "low-carbon luxury", which will replace "low-key luxury" step by step. Gradually a new value of top consumption will come into being (Jin Lv, *et al.*, 2010:236-237).

Global warming is becoming a core engine for low carbon economy and green business development. Going green is not a fashion statement (Hagen, 2007:2). Smart companies know that it is action that interpret the definition and they are moving to get ahead of the game (Coffman, 2007:1). They have learned to reduce their contribution to global warming and get ahead of regulators and gain a competitive edge (Charle, 2007:1). Consequent responsible brand image enables them in a better position to prosper.

5. CHINA'S RESPONSE TO LOW CARBON ECONOMY

From global overview, relevant industries have made great adjustment toward low carbon economy. Changes of global specialization structure are coming soon, as U.S, Japan and Europe have made huge investment in low carbon industry. As one of the emerging economies, China is under tremendous pressure to reduce carbon emission for sustainable development.

5.1. China's Current Resource Condition

China does not possess special resources richness. The basic national condition is large population and relative shortage of per capita resources. Therefore, to promote the long-term industry growth mainly by natural resources is not a

feasible path for Chinese industrialization.

Take energy for example. According to the prediction report of China National Information Centre, China's energy demand will be 2.16-2.32 billion tons standard coal by 2010. To ensure the energy demand growth, China need to proceed substantial energy infrastructure construction in the future 20 years, and a great deal of resources, such as oil and natural gases *etc.*, will still need to be imported. Recently China's energy consumption increased very fast. The annual energy consumption average growth amounted to 4.2% during 1990-2003. The coal-oil-electricity supply and demand conflict is prominent. As Pu Hongjiu, the first vice president of China's Coal Industry Association, said that the domestic demand for coal would be over 2.1 billion tons, while the current mine production with safe operation capacity is only 1.2 billion tons, occupying 61.35% of the whole year coal output. From a general point of view, China's coal resource is fairly plenty. However, it lacks refined search reserves. At present, the available refined search reserves of large and medium-sized mine is about 30 billion tons, which can only be designed for 160 million tons mine construction. It is estimated that by 2020 the coal reserve will lack 125 billion tons, specific search reserves lack 210 billion tons and general search reserves lack 660 billion tons. This will need investment of over 40 billion yuan. Furthermore, the lagged resources management, damaged resources and serious waste deteriorate the resource shortages. Due to the lagged coal production technology, the current coal mechanization degree is only 42%. As far as the main technology equipment is concerned, there is 10-15 years function index gap, compared with developed countries (Wang, 2005).

Actually, China has attained fairly high intensity of energy exploit. Take electricity for example. China's electricity mainly depends on the thermal and electric power fuelled by coal. Data from National Bureau show that China new generated electric power capacity increases 49.3 million kilowatts, 15% more than last year. The total installed capacity is 440 million kilowatts, reaching a very high level. From the view of international comparison, U.S. generating installed generating capacity is about 800 million kilowatts, and 3 countries of UK, Germany and French reach total 300 million kilowatts. However, Japan created much higher gross domestic product than China with 280 million kilowatts of installed capacity. In other words, China's current installed capacity has surpassed the total amount of UK, Germany and French. But China still lacks electricity. One important reason is due to high consumption of many industries. The industry electricity consumption is 74%, while the residents electricity consumption only 11%, the first industry electricity consumption is around 5%.

On the other hand, China's energy efficiency is lower. It is about 30%, 10% lower

than developed countries. The unit product energy consumption of main energy product is 25%-90% higher than developed countries, weighted average is 40%. According to Wang (2004), Chinese thermal power plant coal consumption is 404 grams of standard coal per kilo watts hour, the international advanced level is 317 grams, so China consumes 27.4% more coals per kilo watts hour.

Now China has become the second largest energy consumption country. Great deal of energy consumption has promoted China's economic fast growth. However, the more it grows, the nearer it approaches the binding boundary of resources and environment.

5.2. China's High Requirement for Resources Product

Since 2004 the mineral prices had hit record, due to the strong growth demand of energy, raw material and mineral product. And China's fast economy development is considered as the primary reason for the surging demand. In 2004 the mineral products with higher prices included steel, copper, nickel, aluminium, magnesium, tin, lead, platinum, gold and son on. According to British Commodity Research Institute, from January to November of 2004, the global crude steel production was 945.2 million tons. It firstly topped 1000 million tons of annual production. China's crude steel production increased 22.1% from previous year, accounting for half of Asia and one fourth of the world. In early 2004, 3 world controlling companies—Compahia Vale do Rio Doce, Rio Tinto and BHP Billitons's company—proclaimed that the production of their 2004-2005 financial year major iron ore prices increased 18.62%. These 3 companies also have to increase production by 9%. Analysis pointed out the surging demand of China led to the higher production and price. China has surpassed Japan as the world largest importer of iron ore. According to expert preliminary estimates, the global iron ore seaborne trade in 2004 reached a total of 545 million tons, higher than year 2003 515 million tons, of which 80% of the increase is attributable to China's purchase growth. Currently, the global steel iron demand is still growing. Experts predict the iron ore prices will increase 15% in 2005 (Yan *et al.*, 2005).

5.3. China's Huge Pressure of GHG Emission Reduction

China's rapid economic development causes high demand for forward growth of energy production and consumption. At present, China's GHG emission now ranks second place in the world. Although the "Kyoto Protocol" does not require developing countries, including China, the specific emission reductions before 2012, China must undertake international obligations as a responsible big country. Compared with other countries in the world (see Table **3.3**), China has higher carbon emission intensity every unit GDP. Therefore, China is facing tremendous pressure to reduce emissions.

Table 3.3. Carbon Dioxide Intensity (1970-2025) in World Major Regions (unit: ton/million dollars GDP in 2000 dollar value).

Area	Historical Data				Forecast Data				Average	
	1970	1980	1990	2002	2010	2015	2020	2025	1990-2002	2002-2025
U.S.	1117	917	701	571	501	459	423	393	-2.1	-1.6
Canada	1046	883	691	612	562	527	495	481	-1.7	-1
Japan	627	497	348	359	310	291	274	259	-1.7	-1.4
Western Europe	695	624	471	377	333	307	281	264	-1.9	-1.5
China	2560	1943	1252	605	570	500	436	375	-4.4	-2.1
India	286	312	346	324	272	242	212	185	0.4	-2.4

Source: The Energy Information Administration (EIA), International Energy Outlook 2005 (IEO), 2005.

In 2002 China's carbon dioxide intensity was 605 tons/ million dollars GDP. It was 1.87 times of India, 1.69 times of Japan, 1.6 times of developed countries in Western Europe and 1.1 times of U.S. and Canada. According to American Energy Agency forecast, China's carbon emission intensity follows a declining trend, the average declining rate between 2002 and 2025 is 2.1%, higher than the declining rate in developed countries. In 2009 United Nation's Climate Change Conference, the Copenhagen Accord came into being. Chinese government promised that by 2025, China's CO_2 emission of per GDP would be 40%-45% lower than that in 2005. This has won the high praise from the international community as it was a clear "quantitive index" of CO_2 emission intensity (Tong and Qu, 2017).

5.4. Main Tasks of China's Low Carbon Economy

In order to move forward low carbon economy in China, we need to accomplish the main tasks: cultivating low carbon industry, establishing the supporting system, accelerating the related technology development and application, and promoting clean manufacturing.

The essence of fostering low carbon industry is to impel energy structure adjustment. The original electricity source structure should be changed from single coal-electricity to simultaneous development of renewable power generation from gas-electricity and solar energy, and waste and straw biomass power generation. Huge capacity, high parameter and high efficient fired units should be prioritized to optimize electricity source allocation and upgrade electricity equipment level. The demonstration project of solar photovoltaic power generation and building integration should be further improved. The solar energy use industry should be stably developed. The energy consumption structure

adjustment should be accelerated. In the fields of production and life, the integrate use of clean energy, for example, solar energy, biogas, natural gas and earth heat should be actively advocated. Meanwhile, the use of petro fuel, such as coal, oil, should be minimized and the carbon dioxide emission will be reduced.

The supporting system of low carbon economy is expected to be set up. Solar photovoltaic, wind power, high efficiency energy-saving, new energy storage, transmission and power system automation and other new industries should be improved with the centre of the new energy and energy equipment manufacturing industry. Low carbon industry groups of certain scale should be cultivated. Electronic information (software) industry with low carbon and high output should be developed vigorously and electronic powered electric industry groups, high frequency industry group, automobile electronic industry groups should be built with full effort. Internet games, animation and other creative industries development should be sped up. The animation industry basis in the high new area should be advanced. Advantageous service industry, such as low carbon scientific and technical service industry, low carbon tourism, *etc*. should be expanded. Low carbon education demonstration sites should be planned and constructed. Green food production and processing industry should be developed and green agriculture proportion should be raised.

The development and application of low carbon technology is required to be accelerated. The technology and application of efficient use of coal, energy saving renewable energy and clean energy, carbon dioxide capture and storage should be impelled. The emission monitor technology and important industry clean production technology development and application should be reinforced. The development of clean automobile technology and mobile emission control technology research and industrialization should be sped up.

Clean manufacturing should be promoted. Clean manufacturing policy, regulations and standard should be improved. Clean manufacturing technology, process and equipment should be optimized. All companies should sustainable proceed clean manufacturing, advance and foster carbon dioxide “zero emission” enterprise. Excessive emission and larger emissions should be executed by mandatory clean manufacture audit. Combined with agricultural structure adjustment, ecological agriculture and organic agriculture should be actively developed. Ecological cultural model should be promoted, ecological agriculture construction should be developed and resources and sound treatment of livestock waste should be introduced (Low Carbon Economy Project Group, 2010:58, 59).

6. SUMMARY

Condoleezza Rice, the previous US Secretary of State once said, “If we stay on

our present path, we face an unacceptable choice: either we sacrifice global economic growth to secure the health of our planet or we sacrifice the health of our planet to continue with fossil-fuelled growth."(Haryey, 2007a:1)

Low carbon economy is the consequent choice to tackle global warming and achieve the sustainability development. In this chapter, we first discuss severe consequence of climate change and point out that the object of low carbon economy is to mitigate climate change. Then we introduce different perspectives of low carbon economy and similar connotation as well. The pressures, opportunities and benefits of low carbon economy drive companies to practise environmental responsibility. The pressures come from international policy, investor, national regulation, customers, peers, sub-sectors and supply chains. The opportunities and benefits refer to opportunities to develop corporate capabilities, benefits of early movement and advantages of brand effect. Finally, we analyze China's response to low carbon economy. China's current resource condition, high requirement for resources product, and huge pressure of GHG emission reduction are elaborated, and main tasks of low carbon economy are proposed. As the emerging economy, China will take the responsibility to reduce carbon emission for sustainable development.

DISCLOSURE

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REFERENCES

Air Cargo World. Logistics at Center of Low Carbon Economy, Vol.100, Issue 11, pp:4-6, 2010. Available from: http://web.ebscohost.com/ehost/detail?vid=9&hid=122&sid=2840b289-1fe8-420a-al...14/10/2011

Altman, W. (2009). *Carbon Consultant* Engineering and Technology.

Anderson, K., Bows, A. Reframing the Climate Change Challenge in Light of Post-2000 Emission Trends. Philosophical Transactions A, 366(1882), 3863, 2008.

Barnaby, J.F. Funds Want Oil Companies to Report on Climate. New York Times (February 27), C3, 2004.

Bei, Jin (2005). China's Industrial Development under the Binding of Resources and Environment. *China Industrial Economy, 4*

Bonardi, J.P., Keim, G.D. (2005). Corporate Political Strategies for Widely Salient Issues. *Academy of Management Review, 30*(3), 555-576.
[http://dx.doi.org/10.5465/amr.2005.17293705]

Buchholtz, A.K., Carroll, A.B. (2008). *Business and Society.* Canada: Cengage Learning.

BusinessWeek. Good Works and Great Profits. February 16, pp. 8. 1998.

Charle, S. Strategy and Business: When Addressing Climate Change is Good business, November 29, p.1,

2007.

Coffman, J. Leading Global Business Strategies Map US Global Warming Solutions, November 29, p.1, 2007.

Cools, K. Chemical Week, January 31, pp. 28, 2007.

Facilities Management Energy. (2008). Green tips for a low carbon world, pp. 16, 2008, Available from: www.worksmanagement.co.uk

Feng, J. (2010). *EU Energy Strategy: Towards a Low-carbon Economy.* Beijing: Shishi Press.

Food and Drink Technology. (2007). *Happy Hens Lay Low Carbon Eggs.*

Gang, F. (2010). *Toward a Low-carbon Development: China and the world—Research Group of Chinese Economists 50 Forum.* Beijing: China Economic Publishing House.

G8. Declaration of the Leaders of the Major Economies Forum on Energy and Climate. Retrieved December 22, 2009, Available from: www.g8italia2009.it/static/G8 Allegato/MEF Declarationl.pdf

Hagen, K. How Global Warming Affects your Business Strategy, December 21, p.2, 2007.

Hansen, J., Sato, M., Ruedy, R., Kharecha, P., Lacis, A., Miller, R. (2006). Dangerous Humanmade Interference with Climate: A GISS ModelE Study. *Atmos. Chem. Phys, 7*, 2287-2312.
[http://dx.doi.org/10.5194/acp-7-2287-2007]

Hart, S.L. (1995). A Natural-resource-based View of the Firm. *Academy of Management Review, 20*(4), 986-1014.
[http://dx.doi.org/10.5465/amr.1995.9512280033]

Harvey, F. (2007). *Winds of Change Beginning to Blow.*http://www.ceres.orghttp://www.pewclimate.org/companies_leading_the_way_belc

IPCC. (2007). *Climate Change 2007: Synthesis Report.* Cambridge, UK: Cambridge University Press. a

Jiang, Z. (2010). *The Guidance of EU's Low Carbon Economy to China.*

Jie, Wang, Yang, Lianmin The Energy Efficiency is Only 3% in Our Country. Chinese Industrial and Commercial Times. Sept. 17, 2004.

Jin, S. (2007). Profit: Low Carbon Economy Growth. *World Environment, 4*, 32-34.

Johnston, D., Lowe, R., Bell, M. (2005). An Exploration of the Technical Feasibility of Achieving CO_2 Emission Reduction Excess of 60% Within the UK Housing Stock by the Year 2050. *Energy Policy, 33*, 1643-1659.
[http://dx.doi.org/10.1016/j.enpol.2004.02.003]

Kawase, R., Matsuoka, Y., Fujino, J. (2006). *Decomposition Analysis of CO_2 Emission in Long-term Climate Stabilization Scenarios* Energy Policy.

Kolk, A., Leby, D. (2004). Multinationals and Global Climate Change: Issue for the Automotive and Oil Industries.*Multinations, Environment and Global Competition* (Vol. 9, pp. 171-193). Amsterdam: Elsevier.
[http://dx.doi.org/10.1016/S1064-4857(03)09008-9]

Lash, J., Wellington, F. (2007). *Competitive Advantage on a Warming Plant. Harvard Business Review on Green Business Strategy.* U.S.: Harvard Business School Publishing Corporation.

Levy, D.L., Kolk, A. (2002). Strategic Responses to Global Climate Change: Conflicting Pressures on Multinationals in the Oil Industry. *Bus. Polit, 4*(3), 275-300.
[http://dx.doi.org/10.2202/1469-3569.1042]

Lovins, A.B., Lovins, L.H., Hawken, P. (2007). *A Road Map for Natural Capitalism. Harvard Business Review on Green Business Strategy.* Harvard Business School Publishing Corporation.

Low Carbon Economy Project Group. (2010). *Low Carbon Wars—China Leads the Low Carbon World.* Beijing: Chemical Industry Press.

McKinsey & Company. Business Strategies for Climate Change. April, p. 1, 2008.

Meinshausen, M., Meinshausen, N., Hare, W., Raper, S.C.B., Frieler, K., Knutti, R., Frame, D.J., Allen, M.R. (2009). Greenhouse-gas emission targets for limiting global warming to 2 degrees C. *Nature, 458*(7242), 1158-1162.
[http://dx.doi.org/10.1038/nature08017] [PMID: 19407799]

Monks, R., Miller, A., Cook, J. (2004). Shareholder Activism on Environmental Issues: a Study of Proposals at Large US Corporations (2000-2003). *Natural Resources Forum, 28*, 317-330.

Packard, K.O., Reinhardt, F.L. (2007). *What Every Executive Needs to Know about Global Warming. Harvard Business Review on Green Business Strategy.* Harvard Business School Publishing Corporation.

Parry, M., Lowe, J., Hanson, C. (2008). *The Consequences of Delayed Action on Climate Change.*http://www3.imperial.ac.uk/pls/portallive/docs/1/53345696.PDF

Pinkse, J., Kolk, A. (2009). *International Business and Global Climate Change.* UK: Routledge.

Rogelj, J., Hare, B., Nabel, J., Macey, K., Schaeffer, M., Markmann, K. (2009). Halfway to Copenhagen, No Way to 2°C. *Nature Reports Climate Change, 3*(0907), 81-83.
[http://dx.doi.org/10.1038/climate.2009.57]

Scott, A., Westervelt, R. (2008). Corporate Social Responsibility *Chemical Week.* June 23, pp: 21-23.

Scott, D., Peeters, P., G¨ossling, S. (2010). Can Tourism Deliver Its "Aspirational" Greenhouse Gas Emission Reduction Targets? *Journal of Sustainable Tourism, 18*(3), 393-408.
[http://dx.doi.org/10.1080/09669581003653542]

Sharma, S., Vredenburg, H. (1998). Proactive Corporate Environmental Strategy and the Development of Competitively Valuable Organizational Capabilities. *Strategic Management Journal, 19*, 729-753.
[http://dx.doi.org/10.1002/(SICI)1097-0266(199808)19:8<729::AID-SMJ967>3.0.CO;2-4]

Shimada, K., Tanaka, Y., Gomi, K., Matsuoka, Y. (2007). Developing a Long-term Local Society Design Methodology Towards Low-carbon Economy: An Application to Shiga Prefecture in Japan. *Energy Policy, 35*, 4688-4703.
[http://dx.doi.org/10.1016/j.enpol.2007.03.025]

Tong, Hefeng, Qu, Weishuang (2017). The Scenario Analysis of Chinese Carbon Dioxide Emission in 2020, Outlook of Global Science. *Technology and Economics, 25*(7)

Treffers, T., Faaij, A.P.C., Sparkman, J., Seegregts, A. (2005). Exploring the Possibilities for Setting up Sustainable Energy Systems for the Long Term: Two Visions for the Dutch Energy System in 2050. *Energy Policy, 33*, 1723-1743.
[http://dx.doi.org/10.1016/j.enpol.2004.02.011]

UNWTO-UNEP-WMO. (2008). *Climate Change and Tourism: Responding to Global Challenges.* Madrid: UNWTO.

Wang, Yiyuan, Yang, Dapeng Coal Supply Condition Still Serious This Year. Economic Reference. January 27, 2005.

Yan, Weidong, Ding, Xiaohong Reviewing 2004 World Mineral Resource Condition. China Gold Newspaper. January 19, 2005.

Yun, F., Ma, Y., Liu, Y., Niu, W. (2008). Development Patterns of Low Carbon Economy. . *China Population Resources and Environment, 18*(3), 14-19.

Zhuang, G. (2005). The Way and Potential Analysis of Developing Low-carbon Economy. *Studies in International Technology and Economy, 8*(3), 79-87.

CHAPTER 4

System Feature: Element, Structure and Function of Corporate Environmental Responsibility

Abstract: The main feature of a system includes the element, structure and function. Accordingly, the internal and external elements of CER are important components of CER system. The internal elements refer to the social and natural capital, such as the resources, staff, technology, products and waste, *etc.* The external elements refer to the investors, community, partners, government, customers and other stakeholders. CER can be classified into four levels of economy, law, ethics and beneficence, in light of the pyramid structure of CSR. Each level has its unique function. In the first place, enterprises directly taking environmental responsibility can help reduce social cost and increase social resources allocation efficiency in the long run. In the second place, the legal CER can regulate the company to externalize the environmental cost. In the third place, the ethical CER can ensure the harmonious and just relationship between human being and natural environment. In the fourth place, the charity act of CER can improve the business reputation and credibility and creates a real impact on the social themes of the local communities. In light of SDS, the four levels of CER—economic level, legal level, ethical level and philanthropic level—make progressive development from basic class to advanced class. The capabilities of CER will also continue to upgrade and extend. When companies practice CER, they must recognize the objective relationship between nature and human society and perform well with the four principles of dependence, coordination, symbiosis and sustainability.

Keywords: CER, CSR, Element, Function, Principle, Structure, System.

From the SDS perspective, the element, structure and function features, are the basic technique and attribute of system. Corporate environmental responsibility is a system, with unique element, structure and function, which develop dynamically in terms of certain principles.

1. ELEMENT OF CORPORATE ENVIRONMENTAL RESPONSIBILITY

From the attribute feature of capital, the element of CER includes 2 parts: social capital and natural capital (Guo, 2001). Social capital refers to the internal and external capital of the company. The internal human resource capital includes engineers, designers, chemists, production staff, accountants, environmental staff

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salesmen, *etc*. The external human resource capital includes enterprises stakeholders, such as shareholders, government, community and commercial partners, *etc*. Natural capital refers to the energy and material enterprises used in production. Some elements can be reflected by financial information, such as materials, labor and depreciation, *etc*. Some show the company environmental impact by means of operation and supervision.

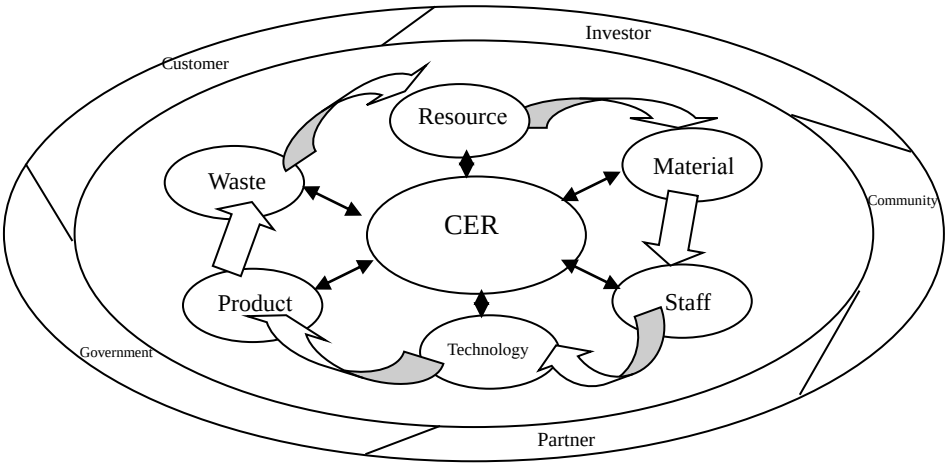

Fig. (4.1). CER element.

From the perspective of system, the element of CER includes two aspects of inside and outside of enterprise. As Fig. (**4.1**) shows, the CER elements of enterprise inside refer to the social and natural capital, such as the resources, staff, technology, material, products and waste, *etc*.; The CER elements of enterprise outside refer to the investors, government, customers, community, partners, and other stakeholders. These elements are the important components of CER. For instance, the staff pursue personal goals relating to career and position to obtain environmentally healthy working conditions that promote personal wellbeing. Shareholders and investors evaluate the influence of environmental damage as well as environment friendly activities for business value. The government strives for protection and conservation of the environment on behalf of the society and use different measures related to the environment as a political instrument in order to win votes. The local community residents increase demand for the environmental quality of the areas they live in. The customers look for lower-priced, higher quality goods and services, encouraging the adoption of environmental standards by supply chains through contractual arrangement. Finally, the partners or competitors seek cost advantages, compare their

performance with that of their competitors and search for opportunities that may stem from improving environmental quality (Groner and Zapf, 1998). More importantly, they all are interdependent on each other and contribute to the balance of the CER system.

2. THE STRUCTURE AND FUNCTION OF CER

In terms of the pyramid structure of CSR (Archie, 1991), which is shown in Fig. (**2.1**), CER can be categorized into four levels of economy, law, ethics and phylanthrophy. Each level has its unique function.

Firstly, enterprises directly taking CER can help reduce social cost and increase social resources allocation efficiency in the long run.

The enterprises economic activities produce two kinds of costs, private cost and social cost. When externalities occur, the social cost is possibly higher than the private cost, and it will reduce the efficiency of social resources allocation. The direct CER and indirect CER will produce different social cost and private cost (or enterprise cost). The private cost of indirect CER includes various environmental protection duties upon legal regulation. The social cost not only includes enterprises payment, but also includes government investment for other environmental protection cost and medical cost caused by environmental problems, *etc*. Obviously, these costs are much greater than the enterprise private cost. The private cost of direct CER not only includes the cost caused by conforming to the legal obligation, but also includes the cost caused by actively adopting the environmental protection technology which is beyond the government requirement, *etc*. In addition to the enterprise cost, the social cost includes a series of cost saving, which is benefited from using advanced environmental protection technology (Lu and Zheng, 2006).

Fig. (**4.2**) clearly shows the social cost and private cost curves in two manners. In the indirect manner, enterprise social and private curves are manifested as IP curve and IS curve. In the direct manner, enterprise private and social curves are shown as DP and DS curves. In the indirect manner, because the social cost is much greater than the private cost, the IS curve is higher than the IP curve. Meanwhile, in the indirect manner, because the environmental problem is not solved from the source and only relied on the society to deal with the symptoms, the social cost will be increasingly high in the long-term. Therefore, in the indirect manner, the social cost curve IS slope is continuously higher than the private cost curve IP. In the direct manner, the reason that social cost curve DS is firstly higher than private cost curve DP and lower than the social cost curve IS and private cost curve IP is because in the direct manner, the enterprise puts more investment for environmental protection than in the indirect manner at initial stage

for radical solution of environmental problem, as it does not have economy of scale. However, with the result of comprehensive governance, the later payment for the environmental protection cost will be less than that in the indirect manner. Some people who oppose to CER only see the higher payment for CER (*i.e*. DP curve higher than the IP cure at the beginning), but they fail to observe the consequent saving cost at the later stage (*i.e*. DP curve lower than the IP curve subsequently). The idea that CER will lead to damage in various aspects is just one-sided and short-term, such thinking is not dialectical.

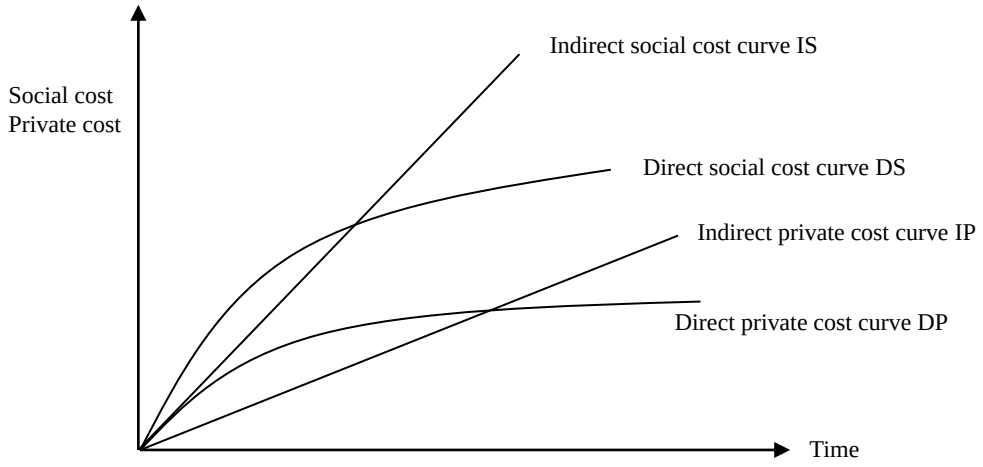

Fig. (4.2). CER in the direct and indirect manner (Source:Lu and Zheng, 2006).

Secondly, the legal CER can limit the company to externalize the environmental cost.

The legal structure of CER is that enterprises should take the environmental protection obligation, which will not disappear with the termination of business, according to the clear statement rule (Wu, 2005). Therefore, the legal CER has three attributes, where the first one is the legal feature. CER is the responsibility, whose content is based on laws and regulations, not only including the obligation, rules and laws made by the independent sector, but also the legal responsibility regulated by other sectors for the protection of environment and natural resources. The second one is the feasible feature, it has two meanings; one is the possibility of behavior to take corresponding responsibility, that is, if an enterprise violates the compulsory duty regulated by the law, it is feasible in reality to enable it to take the legal responsibility of its behavior. For example, when a company violates the law and discharge pollution emission, it is feasible to punish this behavior. The other one is feasibility to take responsibility for this behavior. If the

effect is feasible when an enterprise violates the legal compulsory obligation and takes the responsibility, the behavior may receive the expected legal effect. The third one is extensive feature, that is, the environmental responsibility is not removed immediately as soon as the business terminates because of the public attribute which leads to the economic externalities, environment becomes the victim in the pursuit of economic benefit, and the gradual and hidden deterioration of environment lead to wanton destruction. The environmental pollution caused by the enterprises does not disappear immediately after the termination of business. According to the traditional company law theory, the responsibility entity will lose, because of business termination, the environmental responsibility will be taken by others or the society. It will be opposite to the fairness and justice of law and also violate the 'Polluter Treatment Principle', regulated by the Chinese Environmental Protection Law.

CER aims to let companies internalize the environmental cost caused by the business operation. The manifestations contain implementing pollution emission charge, restoring the environmental condition, ending production and operation, and compensating others losses, *etc*. Based on the precondition of compulsory environmental obligation regulated by the environmental law, these obligation assumptions are designed to control the business behavior within the reasonable range, namely, making use of environmental resources properly. If enterprises violate the legal obligations, they will get negative legal assessment and take corresponding legal responsibility. Enterprises taking CER can constraint the behavior to externalize environmental cost. The behavior is manifested in the following formats:

I. As for the subjective state of enterprises, externalizing the operation environmental cost can be divided into two cases: One is the operational behavior which intentionally conceals the harmful business activities. Because of the state monitoring of the environmental pollution or destruction and the community supervision for the corporate harmful behavior, companies often adopt various methods to conceal their negative behavior. For example, although the enterprise builds the sewage treatment equipment, which increases the business cost, the enterprise will choose the sewage discharge secretly, such as building underground passage to discharge the sewage. Some enterprises withhold the information about their products which they know would cause damage to the environmental once they are used, in order to save their product sales adversely. In this case, the companies need to make the corresponding legal obligations. In a certain period, the companies should disclose the relevant environmental information and take the responsibility for the concealment, which caused the losses of the third party. The other case is that companies result in harmful environmental behavior. In some cases, after harmful environmental behavior, the

companies do not actively control the consequence, but allow the harmful result to occur, which damages the legitimate interests of the public. In this case, appropriate punitive measures need to regulate the companies' laissez-faire behavior. The form of environmental responsibility should be based on fine and the company should bear part of the cost to restore the environmental conditions, so that the companies take the liability of environmental losses due to laissez-faire.

II. As for the geographical attributes of the externalizing environmental cost behavior, the externalization of environmental cost can be divided into three kinds. The first kind is that the behavior of the externalization of environmental cost that occurs at the place of action. For example, when the sewage emission takes place in the area where the enterprise is located, the damage caused by the pollution also occurred in the surroundings. The environmental degradation caused by the sewage discharge and the surrounding residents and property damage is basically territorial. In this case, CER should be ruled by the national law and local regulations. The second kind is the externalization of environmental cost transferred from the developed areas to the developing areas. Within the scope of one country, because of the imbalance of economic development, economic policy differences exist in different regions. Enterprises take advantage of the economic development need of backward regions and therefore undertake arbitrage in the underdeveloped areas. Thus, they made the pollution transfer between the regions. In this case, CER should be controlled by the cross-regional regulations. The third kind is the externalization of environmental cost transferred from the developed countries to developing countries. As the world economic integration, many companies in developed countries export the serious pollution industry to developing countries. In the name of international trade, many enterprises in the developing countries import the toxic and hazardous industrial waste from the developed countries. Usually, this phenomenon is known as the international transfer of pollution. In this case, the object of environmental cost externalization of the developed countries is not their domestic environment. Because of the integrity of the global environmental protection, environmental degradation in the developing countries will also spread to the neighbor countries or even worldwide. Therefore, the international pollution transfer also refers to the behavior which should take CER and externalize environmental cost. The legal sources of CER include international law and domestic law.

III. The legal behavior of enterprise externalizing environmental cost can be divided into two kinds. One kind is the legal behavior. That is, the enterprise does not violate the obligation regulated by environmental law, but it will externalize the environmental cost. For example, the compliance behavior of sewage emission. The sewage emission is charged because the behavior destroys the

environmental benefit of the whole society. As the economical entity, the enterprises contribute to the economic development and welfare of the whole society. They have to use the natural environmental resource as the basis, and they are entitled to execute certain environmental rights. Another example is the case in countries where the pollution emission trade is implemented. Although the enterprises engage in transferring pollution, such behavior is allowed by law. The reason is that the behavior can reduce the cost to deal with pollution in certain environmental capacity condition and is helpful for the protection of integrity environmental welfare in a certain area. The other kind is the illegal behavior. Because such behavior will damage the community interests, most externalizing environmental cost behavior is prohibited by law (Wu, 2005).

Thirdly, the ethical structure of CER facilitates the harmonious and just relationship between human being and natural environment.

When we pay attention to justice implementation, traditional ethics are only limited to the human and social levels. One of the theoretical foundations of CER is the environmental ethics, which breaks the person to person limit of traditional ethics, and establish the view on the dynamic three- dimensional coordination "human, nature, and society". Namely, justice is used as the notion foundation, the general principle of justice theory is applied to coordinate the interests of various stakeholders on the environmental issue. In particular, the justice is elaborated in the interpersonal justice, international justice and interspecies justice.

The interpersonal justice refers to the interest groups of different time, different nationalities, different sexes, obtain the equivalence between right and duty, contribution and demand, opportunity and risk, sin and sanction, function and status, *etc*. It mainly includes intra-generation-justice and inter-generation-justice.

Intra-generation-justice means that people keep disputes at the same time in different places. The essence is that people of the same generation should fairly enjoy the resources, jointly protect the environment and take rational responsibility and get proper compensation. The World Environment and Development Conference in 1992, was the effort that the developed countries and developing countries made on fairly using resources and rationally taking environmental responsibility. The Rio Declaration on Environment and Development finally settled the reasonable regulation: Upon the United Unions Charter and International Law Principle, various countries have the right to explore their own natural resources based on the environment and development policy, and take the environmental responsibility to guarantee the activities in their territory or in their control. They will not damage other countries or other

areas beyond their control. As the global environmental degradation is caused by various factors, the responsibilities are common, but differential. The developed countries admit that they have the responsibility in pursuing sustainable development of international activities, because they have brought the pressure to the global environment and they have the technology and financial resources. The similar case exists in the fairness between the rich and the poor. In terms of the equivalence principle between right and duty, it is emphasized that the rich who consume more resources and export more pollution should take more responsibility.

Inter-generation-justice is the notion that executing fairness between the current generation and the next generation in the same place at different time. The basic requirement is that when the current generation grow to meet their own requirement, they should maintain the load capacity of the environment system to sustain development. In 2000, K.S. Shrader Frechette, the chairman of new international environmental ethics association, defined that every next generation obtain continuous survival and the developing benefit from the previous generation, the current people should return what they have received from the previous generation to the future generation. In other words, there is a 'mutual rewarding' relationship with the past, the present and the future. We and the next generation all belong to one moral unity, and they have the equal survival right.

International fairness is the reality manifest of the intra-generation-justice and inter-generation-justice in the cross of time and space, and the expansion of states. If the inter-generation-justice means the fairness in environmental protection among various stakeholders, international fairness will refer to the fairness on the environment issue treated by countries (namely, the representative entities of different individuals and groups in the first place). In addition, the national interest not only relates to the current generation development, but also the survival of the next generation of this country. Therefore, the international fairness internally includes the inter-generation-fairness, as per country format. In other words, the awareness of coordinating and unifying environmental ethic elements between countries is of great importance to solve the international environment issue.

Inter-species-justice refers to the fairness between human and other species, such as animals, plants, micro-organisms and other natural environment components. Since the 15th century, there has been a subject-object dichotomy between human being and heterogeneous group. A lofty man regards himself as the crown of all creatures, such as animals, plants, micro-organisms, who can be driven at his disposal. The advancement of technological revolution and industrial revolution have actually helped human to win high degree of material civilization. At the

same time, global issues, such as environmental destruction and financial crisis, have brought unprecedented challenge to the human survival and development. Consequently, human beings started to review their own way of life and had to give up the view that man belonged to the supernatural class, but was the product of gradual formation in the process of departing from natural constraint (but not separation). On the other hand, humans began to reflect upon the heterogeneous existence. In the view of animal liberation right theory, animals are same as human being, who can have the equal right to experience happiness and avoid pain; they have the same 'natural value' and therefore 'all animals are equal'. Biological centre theory advocate that all biological lives are valuable, all natural creatures have their own 'goodness', so human being should 'awe life', 'respect nature', and extend the moral value to all the life entities, including wild animals and plants. The environmental centre theory stresses that animals, plants, land, marshes, rivers and other non-living natural existence, natural process and natural environmental system have their own value as an integral part of nature and environmental interests of the community and therefore they deserve human attention (Zeng, 2004).

Finally, the charity act of CER can improve the business reputation and credibility and have a positive impact on the social themes of the local communities, when business engages in cash funding for public welfare, donation or non-cash service. Some international companies have plenty of choices for charitable contributions. They broke through the tradition of cash contributions and began to focus on more creative contribution strategies, including the contributions of products and services, providing technical expertise and allowing beneficiaries to use their facilities and idle equipment. Outdoor Recreational Equipment Company is the leading provider of professional outdoor equipment. For seven consecutive years, it has been honored as one of the "America's 100 Most Attractive Companies" by "Fortune" magazine's "Best Enterprise Special Report". The company's "allocation plan" was unique, as it let its employees to nominate potential recipients of funding. The funding is supported by the company's public affairs sector, about $1.8 million per year, and focused on two fields. Environmental project aims to protect the forests and waterways, so that these resources can be enjoyed by more people who are fond of outdoor activities. Besides, better use of protection of the natural resources can bring more physical and mental pleasure to mankind (for example, the fund is used to enhance the dialogue between user groups and policy makers). Outdoor recreation project funding aims to enable more people to join outdoor activities (such as, a grant is used to provide students with sleeping bags in outdoor adventure education projects). It encourages people to participate in healthy recreational activities, supports the safety of outdoor recreation activities and cares for the outdoor resources. The grant scheme included a number of measures, for example, volunteer service hours, the number

of children who took part in outdoor activities, the number of people who benefited from the facilities donation or the number of participants in one program. According to the survey, the funding plan has become the source of employee's pride and loyalty, strengthened the company's brand position, created the green corporate culture and helped the company form the collaboration with the external organizations who also created value in those activities (Kotler, 2006).

Thus, the four levels of CER—economic level, legal level, ethical level and charitable level—make progressive development from basic class to advanced class. The capabilities of CER also will continue to upgrade and expand.

3. PRINCIPLES OF CER FULFILLMENT

The dynamic development of CER is not in chaos, but proceeds in an orderly way and is regulated by certain principles. It mainly includes the relationship between business and the environment, and hinders business from increasing environmental pollution and breaking the environment balance. When companies fulfill CER, they must face the objective relationship between nature and human society and the following four principles are instrumental in guiding corporate behavior.

3.1. Principle of Dependence

In this principle, the enterprise has sufficient reasons to obtain material from the natural environment to meet its own basic needs of survival and development. Enterprise is composed and managed by people, who are originated from the nature. Such fact means that human being can never get ride of the nature and always subject to the constraints of natural laws. Similarly, the production process is a continuous energy exchange with the nature. This fact determines that the enterprises must rely on the nature to survive and develop. Human beings, or the business, continued development and progress are a continuous battle with the environment and a constant process in which humans transformed the nature. In the early period of human development, the utilization of nature was blind and spontaneous. Humans ability to transform the nature is very limited and the environmental conditions determine the human existence and development condition. In the relationship between man and nature, the weak and passive position of human being is rather obvious, however, with the continuous improvement of human initiative and his ability, human can now transform and deploy the nature, even destroy the nature wantonly to meet his own need. Consequently, he gets the nature's revenge and faces with a variety of environmental problems.

Thus, whatever position human being holds in the contest with nature, he can never depart from the nature. In this sense, the first principle of CER fulfillment is that the enterprises have adequate reasons to get the production material and subsistence from the nature to meet the basic needs. CER does not rule out the business own interests. On the contrary, it protects the business interests to a greater extent. But it does not mean that business can maximize their own economic interests recklessly, obtain all the resources without any control, and discharge the waste without considering the environment safety.

3.2. Principle of Coordination

The principle of coordination means that the enterprise should cope with relationship between its own and the natural environment in order to survive and develop. The relationship between the enterprise and the natural environment is closely related to each other. As a citizen and a property collection created by people, the enterprise is the product of natural environment, which is also the carrier of the enterprise survival and development, provided with necessary resources by the nature. If the natural environment is destroyed, human survival and development will be the river without water and the tree without root. For a long time in the past, a lot of inappropriate business behavior on the natural environment has seriously reduced its capacity to support the survival and development of enterprises, which encountered fundamental threat consequently. Facts show that the relationship between business and natural environment and corporate attitude towards the environment are facing an increasingly serious ethical conflict. The pillar idea of CER is to maintain the common survival and development between business and environment and to establish the harmonious relationship between them.

In the mutual relationship between business and environment, business is active and environment is passive. In order to show the significance of environmental existence and value, business should actively use a variety of environmental conditions for creative practice. It does mean that the companies can conquer the nature and be the master and manager of the nature, but rather companies should conform to the nature and follow the law of the nature environment when using environmental resources. Firstly, companies should regard environment as their partner and use various environmental conditions equally and scientifically. Secondly, companies should- use their own capabilities and technological methods to selectively guide the development direction of nature, which is helpful for the business and environment. Finally, if companies force to conquer nature and destroy the objective laws of science, the nature will retaliate. As Engels pointed out that we should not revel in the victory of the natural world, for every victory, nature could retaliate against us.

The main idea of Heaven-Human-Unity in ancient China emphasized the unity and harmony. Human and nature coexist in one continuum, they must be coordinated and harmonious. The peaceful coexistence promotes paragenetic state, in which conflict can be avoided. In terms of companies, they must obtain various materials from the nature to survive and get maximum benefit. However, this consumption should be based on the respect for the nature in terms of taking and using them with restraint. In order to survive and develop, human being should blend with the nature, respecting and complying with the natural laws.

3.3. The Principle of Symbiosis

The nature is an organic unity composed by the human and environmental system in a particular space. In a certain range of time and space, the elements of the system are in dynamic and coordinated balance. Enterprise is a system, with its own inherent laws. Symbiotic principle requires enterprises to be harmonious with the environment in the process of material production, that is, the enterprises must consider the economic and social benefits to keep environmental balance and promote the common development.

Companies must coordinate the common interests of their own, the environment and the whole society. The trinity of business, society and the environment composes an interdependent, symbiotic and organic integrity. Besides, healthy and orderly social and ecological environment are the prerequisites for the business sustainable development. Symbiotic principle demands that business use of natural resources must be constrained to a reasonable limit, which is within the capacity load of the natural environmental system. Thus the economic benefits, social benefits and environmental benefits can be jointly achieved.

In addition, companies must cope with the common interests among their own, other regions and the whole world. The earth is the living organism of atmosphere, oceans, soil and forests. Each of its components are shared by all human kinds and not owned by a single enterprise, country or area.

On this earth, any business behavior will not only affect the ecological environment in which they locate, but also the surrounding area, and even the overall ecological environment. Only when all companies recognize the impossible individual benefits which are beyond global integrity, can they properly handle their own interests together with the common interests of the local region, home country and the whole world. In the production process, companies should follow the scientific laws, take responsibility for their own actions in order to achieve support for their own sustainable development.

3.4. Principle of Sustainability

Sustainability principles require companies to coordinate the relationship between their benefit and the long-term interest of environment and society. That is, companies achieve their own profit, while safeguarding the sustainable development of environment and society. They should not seek business interests at the expense of long-term interests of the society and future generation.

Enterprises firstly should achieve their own benefit and ensure their own sustainable development. In order to be competitive in the market, enterprises must have the potential to maintain sustainable development. Only pursing the short-term interest cannot guarantee the long-term development. The sustainable business development forbids enterprises to abuse the natural resources and discharge the waste to nature freely, which will not only destroy the current business market image and competitiveness, but also increase the production and operation cost in the future.

Natural environment is gradually formed and developed. Excessive use of environmental resources to get the business interest will affect the sustainable development, and thereby reduce its ability to support the business sustainable development. In the business material production, resource utilization often determines the product quantity and quality under the same context of production capacity and conditions. The development and use of nature is not based on the random needs. When obtaining resources from the environment is faster than the environment self-production capacity and self-recovery, it leads to the decline or depletion of environmental resources. On the other hand, environment has a self-purification process and difference. Companies must take full consideration of the environmental quality and prevent the unbearable environment from blocking the business sustainable development ultimately.

Enterprises should also support the sustainable development of the country, nationality and society. The human existence and development proceed from generation to generation. The future generation and modern generation have the same rights to use nature. Therefore, the nature does not subsist only for the survival of one generation. If one generation blindly explores and even wantonly destroys the nature, it will deteriorate the environmental conditions of the future generation. The sustainable principle requires the enterprises not only to maintain their own current benefit, but also to maintain the long-term benefit of future business and human being (Ren, 2005).

4. SUMMARY

Corporate environmental responsibility is a system with unique features of

elements, structure and function. It develops dynamically in terms of certain principles.

The internal elements of CER include factors, such as resource, material, staff, technology, product, waste, *etc*. The external elements include community, business partner, government, customers, *etc*. When these interactive elements have been put into business action, the business can save the cost, minimize waste, make innovation, increase public acceptance and achieve government support. CER is divided into four levels of economy, law, ethics and beneficence, and each level has an important role. In other words, the four functions of CER enable enterprises to develop products that deliver superior customer value and reduce environmental pollution and finally win a high market share. Meanwhile, the four principles of dependence, coordination, symbiosis and sustainability motivate the business to take environmental responsibility in an orderly way. They are very significant in training the management or employees to understand the limited resources, harmony between environment and human being, and long-term benefit of business and society.

REFERENCES

Carroll, A.B. (1991). *The Pyramid of Corporate Social Responsibility: Toward the Moral Management of Organizational Stakeholders. Business Horizons.* July—August.

Groner, S., Zapf, M. Companies, Stakeholders and Environmental Protection. Umwelf Wirtschafts Forum, Vol. 3, pp. 52-57, 1998.

Guo, X. Environmental Accounting—Integrating Environmental Element into Management Decisions, PhD thesis. Fujian: Xiamen University, 2001.

Jie, W. (2003). *Systematic and Dialectical Science.* Beijing: Renming Press.

Kotler, P. (2006). *(Jiang Wenbo translated), Corporate Social Responsibility: Expanding More Business Opportunities Through Public Welfare.* Beijing: Mechanical Industry Press.

Lu, C., Zheng, W. (2006). *Corporate Social Responsibility Essence: Explanation on the Basis of Resources Allocation Efficiency. Chinese Corporate Social Responsibility Report* (p. 93). Beijing: China Financial and Economic Press.

Ren, Y., Shen, D., Dong, Y. (2005). *Corporate Ecological Culture Research.* Dalian: Dongbei Financial and Economic University Press.

Wu, Q. On the Corporate Environmental Responsibility, PhD Thesis. China Ocean University, 2005.

Zeng, J. (2004). *Thinking on the Nature: Exploration on the Western Environmental Ethics Ideas.* Beijing: China Social Science Press.

CHAPTER 5

International Perspective: Corporate Environmental Responsibility in Developed Countries

Abstract: The government laws and regulations, entrepreneurial spirit and corporate culture, and corporate self-discipline are important for the entire enterprise system to improve environmental management. The German government achieved the changing pattern of economic development, the industrial restructuring and the increase of production technology level and energy efficiency through a series of laws and corresponding measures. The material recycling has been promoted and the human energy needs from the environment has been reduced; Japanese company's spirit of learning and innovation is admirable. Honda's development is inseparable from its founder Soichiro Honda, who upheld the responsibility sense and innovation spirit. The Honda corporate culture is reflected in the practice from providing quality products for the society to realizing the "zero emission" to the outside of the factory. This enables Honda to keep in good condition in the complex and high economic competition and gradually achieving the development target toward excellence; U.S. Xerox environmental leadership program can be the paradigm of corporate to take proactive measures rather than rely on government support. Xerox total quality management encourages full participation. It calls for the proactive actions, such as choosing materials to meet environmental protection requirements, reducing waste pollution, reusing Xerox recycled products and equipment, enhancing packaging and taking responsibility for waste disposal. Improved asset management makes Xerox useless assets between the internal and external departments maximize effectiveness. As SDS shows, there is a significant gap between developed and developing countries in time and space and a clear leading advantage in the development levels. The advanced CER management experience is the case.

Keywords: Corporate culture, Entrepreneurial spirit, Government, Law, Regulation, Self-discipline.

According to SDS, there is no difference and there is no hierarchy. The system has numerous multi-levels, which are relatively stable. CER in advanced countries has grown to a higher level. The successful experience of Germany, Japan and the United States tells us that government laws and regulations, entrepreneurial spirit

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and corporate culture, and specific measures of environment leadership are important to fulfill CER.

1. GERMAN CONTINUOUS IMPROVEMENT OF LEGAL SYSTEM

Global resource scarcity and serious environmental pollution promote German society reaching the consensus that economic development must be sustainable, resources must be used sparingly and waste must be recycled instead of being disposed in the landfill. German government focuses on the recycling of waste resources and renewable resources development. From various legislative documents of waste recycling, utilization and management, we can sort out the institutional framework of the German economic recycle formation, which roughly has gone through four stages (Huang and Liu, 2007).

1.1. End Stage of Waste Disposal

This stage began in 1960s, when people had a preliminary understanding of waste dumping and pollution, but their awareness was not very clear. In 1972, Germany enacted the "Waste Disposal Law", and established the end waste disposal center. The method is that part of the waste is incinerated to obtain electricity and heat and the waste that cannot be burned is put into landfill. Although the end waste disposal can not radically reduce the amount of waste, the recycling waste utilization began to get attention. The evolution of waste disposal notion and corresponding legal situation is shown in Table **5.1**.

Table 5.1. Developing Process of Waste Disposal Notion and Use of Waste Legislation in the First Stage.

Status and Motivation	Law and Regulation	Target (Regulatory Difficulties)
Enhanced awareness of waste disposal inadequacy; Starting point: epidemic prevention, public safety and order, public interest.		Orderly classification of waste disposal, reduction of waste pile.
Further attention to environment issue.	Waste disposal law in 1972.	Orderly classification of waste, reduction of waste pile.

Source: Hartwig and Meyerholt, 1994.

1.2. Waste Minimization Stage

Till 1973 oil crisis, the issue of environmental protection and energy initially received attention. Particularly with regard to the rational use of energy and reduction of dependence on imported raw materials, the waste economic research turned to waste reuse study. Germany used various methods and reduced a lot of waste.

1.2.1. The Storage Method

Germany has over 1000 waste sites with special devices. With the increasing amount of waste generated, the storage method can not solve all the problems, because no new sites can be used, and the accumulation of waste height is constantly growing. At the same time, the problem of contaminated soil and underground water, gas occurrence, insects breeding and airborne dust pollution came out. For these reasons, the storage method began to fade.

1.2.2. The Incineration Method

The waste heat value and the resulting energy obtained have been increased. The purpose of waste incineration is not only to reduce the waste amount, but also to increase the production energy. However, the cost spent on the purification and removal waste incineration and residue is very high. With the improvement of incinerator, waste incineration has become relatively safe to the environment.

1.2.3. The Composting Method

It is mainly used to break down the organic matter of micro-organisms and produce the organic fertilizer for horticultural and greenhouse requirement and rehabilitation of land and green city. In the 1990s, there were 20 waste composting companies, which provided more than 300,000 tons of compost each year in Germany.

1.2.4. The Pyrolysis Method

In a variety of methods of waste removal, pyrolysis has shown its increasing importance. In addition to protecting the environment, waste pyrolysis can promote the purified material production, organic waste deep processing and energy access.

1.2.5. The Sorting Method

It is of practical significance to pick the waste paper, synthetic materials, especially plastics from waste. However, the manual labor has a larger proportion in this method. In recent years, the German domestic renewable resources sorting method has been developed smoothly. The recycling rate and the similarity of the raw material have also reached to a higher level.

In addition, German waste recycling system starts from the packaging industry. In 1980s, the disposal and management of packaging waste brought great impact on the natural resources and human survival environment. According to EU statistics, packaging waste accounts for 50% of all waste. Therefore, in the late 1980s, the

European Union began to issue a series of laws and regulations designed to address waste disposal problem generated in the secondary pollution process. Gradually, a strict management system was formed for packaging material. And Germany was set as a prime example in the management of packaging waste. As early as 1986, Germany promulgated the "Waste Act" which legally provided the recycling technology as the priority technology. In the ordering of target priority, the recycling technology made the final priority of waste reduction and decontamination disposal higher than the waste reuse. In the early 1990s, Germany made a set of new management system for the packaging waste to strengthen the closed material cycling system. In 1991, the "packaging regulation" was passed through to restrain the product package and operation. And the waste reuse scope was expanded, the producer responsibility system was enhanced. At the same time, "packaging regulation" required recycling package waste, and it was the producer's obligation to avoid the generation of waste from the source. The waste use was prior to disposal and thus the responsibility was transferred from the government to business in order to establish the market economic system based on the waste collection system. At this stage, people began to reflect their awareness of environmental protection. The waste disposal policy started to function. However, the policy management remained at the level of waste classification (see Table **5.2**).

Table 5.2. Developing Process of Waste Disposal Notion and Waste Utilization Legislation.

State and Motivation	Laws and Regulations	Target (Regulation Difficulties)
In 1972, the research "growth limit" of the Rome Club: One day some energy will dry up. As the second raw material, waste can be used to reduce waste disposal burden and reduce dependence on imported energy.	1974 "Federal Act to Control Air Emissions"; 1975 "Economic Law of Waste".	Introduced the waste recycling ideas and banned the waste to be determined.
Deficits appeared in monitoring field and waste economic use project began to be implemented.	In 1976, Waste Utilization Act was firstly modified.	Improve the waste disposal efficiency and begin to think about waste utilization.
Consider how to use the remaining material (waste) as the second raw material: make full use of the "alternative" source of raw material; reduce the pressure of waste disposal and protect the environment.	Promulgated the liaison council draft addressed for the research and development project of reusing the industrial and domestic waste by the European Community.	Prepare for the research of waste reuse.
Strengthen the waste economic regulation awareness.	In the eighth term of Legislative Assembly, the waste utilization amendments failed.	Strengthen the waste reuse.

(Table 5.2) contd.....

State and Motivation	Laws and Regulations	Target (Regulation Difficulties)
Act amendments: the nominated and implemented sludge re-use approach has been halted, because it generated hazardous substances and caused a burden, and health elements were considered.	In 1982, the second edition of Waste Disposal Law was produced.	Achieve the safe reuse of sludge disposal.
Act amendments: measures must be immediately made due to the case of shocking abuse.	In 1985, the third edition of Waste Disposal Law was produced.	Monitor the illegal waste disposal.

Source: Hartwig and Meyerholt, 1994.

1.3. Waste Harmless Stage

Because of the introduction of "Waste Act", there is an essential change in waste economy. The important symbol of this transformation is that people transfer their attention from the waste disposal focus to the waste reduction and recycling commitment. Based on this starting point, people's attention gradually transferred from the end of production chain to the initiator and the topic of research core was no longer how to "output" but how to "input". In 1996, the "Circular Economy and Waste Act" implemented in Germany clearly stated: Firstly, waste production should be avoided; Secondly, the unavoidable generation of waste should be fully recycled; Finally, the waste which can not be recycled should be removed harmlessly (or put into landfill). This requires producers managing their products with the concept of "cradle to grave". Namely, their responsibility for the product is not only to manufacture, but also reuse and safely remove the waste. This makes the company commit to new produce research and old product improvement with the technical and economic feasibility. And the changed product will be versatile, long living, and easy to be maintained and recycled with safe disposal. Consequently, more material resources can maintain the production circle and form the closed material cycle (see Table **5.3**).

Table 5.3. Waste Disposal Notion Development Process and Waste Management Legislation in the Third Stage.

Laws and Regulations	Target (Regulation Difficulties)
In 1986, the original fourth edition of "Waste Disposal Act" was changed into "Waste Act".	To avoid waste generation and reuse waste.
In 1987, the waste oil proposal was regulated.	To establish the prerequisite rules of waste oil recycling generation and provide the relevant illustration of the sale of the oil.

(Table 5.3) contd.....

Laws and Regulations	Target (Regulation Difficulties)
In 1988, waste transnational transportation was regulated.	To provide the waste transnational transportation management (waste transportation).
In 1989, the handling halogen-melting agent use was regulated.	To regulate the after use halogen-melting agent treatment: store separately, prohibit mixture and indicate obligations.
In 1990, the waste regulation was established, according to the article 2 paragraph 2 of waste use act provision.	To establish the waste requiring special monitoring according to the waste classification catalogue.
In 1990, the remaining material was regulated according the article 2 paragraph 3 of Waste Act provision.	To define the remaining material requiring special monitoring according to remaining material classification catalogue.
In 1990, the collection, transportation and supervision of waste and remaining materials were regulated.	To provide the waste and remaining material requiring special monitoring: the permit of collection, transportation and negotiated treatment methods and certificate of waste to be disposed.
In 1992, sludge disposal was regulated.	To regulate the agricultural land use sludge reuse: determine the boundary value of heavy metals, organic compounds content and strengthen the proof obligations of sludge to be disposed.
In 1993, avoiding and dealing with waste fertilizer were regulated.	To combine the article 7 and article 4 paragraph 1 with the article 4 of BImSchG on avoiding and dealing with waste fertilizer regulation: permit the advanced change of waste incineration facilities and the consequent waste incineration facilities permitted just by BlmSchG, limit the social force participation.

Source: Hartwig and Meyerholt, 1994.

1.4. Waste Recycling Stage

In the fourth stage, the notion of waste reduction and harmless treatment was what was stated clearly in the Circular Economy and Waste Act: ……between the raw material supplier and waste disposal, a chain, which follow the reuse rule, will be set up ……In the production process, the issue of how to use and remove waste will be taken into consideration. In 1999, the Packaging Act began to be effective, and it firstly defined that the producer should be responsible for the waste generated in manufacturing. The introduction of the act had a profound impact on the waste reuse economy. The promulgation made the circular notion laid a solid foundation in economic activities and realized the rational use of resources (Wagner, Matten, 1995). The implementation of Circular Economy and Waste Act changed the situation of the producers only responsible for production and government responsible for the centralized disposal of consequent waste. The responsibility was transferred. Germany regarded waste as "resources which was placed at the wrong place". Based on this notion, the regulations were made to promote waste reuse of various industries (see Table **5.4**). Consequently, the

beverage packaging, scrap metal, slag, scrap cars and discarded electronic goods were turned "from waste into treasure" (Xu and Dong, 2005).

Table 5.4. Waste Disposal Notion Developing Process and Waste Management Legislation in the Fourth Stage.

Laws and Regulations	Target (Regulation Difficulties)
In 1990, waste and combustible material equipment regulation and the 17th federal environmental protection regulation ("Federal Regulations to Control Air Emission") were promulgated.	To set the boundary values of waste incineration equipment according to different emissions.
In 1990, the second general management regulation of Waste Use Act and Waste Technology Guide were promulgated.	To determine the treatment requirement of storage, incineration and chemical (physical or biological) wastes in the middle storage; to define the handling equipment and placement requirement; to conceptualize the technical standards.
On June 12th 1991, the Packaging Regulation was made, and was amended in the summer of 1998.	To establish the first recycling regulation in German history, based on the 14th article of Waste Act.
In 1993, the third general management regulation of Waste Act and the Domestic Waste Technology Guide was promulgated.	To reduce the harmful domestic waste and the waste which will have negative impact on the environment by means of necessary predisposal of these waste.
The Circular Economy and Waste Act, which was promulgated in 1994, was amended for the fifth time as waste use act, and was formally implemented in 1996 after two year transitional periods.	To reduce waste in circular economy and transfer the end treatment to the front-end governance, namely the perpetrator principle, which redefine the waste concept.
In September 1996, the following regulations were promulgated: Regulations of European Waste Catalogue; Special Supervision for Waste Act Treatment Regulation; Use and Treatment Proof Regulation Transportation Permit Regulation Professional Removal Waste Corporation Regulation Waste Treatment Corporation Guidelines and Permit Waste Reuse Economy Concept and Waste Balance Regulation.	To implement the European Union principle in Germany.

Source: Hartwig and Meyerholt, 1994.

From the above four stages, we can find that Germany has a comprehensive legal framework, not only in its complete legislative system, but also in the continuous improvement amendment system. Thus, the whole process from "how to dispose the waste" to "how to avoid the waste generation" is formed into closely linked organic system. Only by adjusting the outdated rules and regulations, the unnecessary cost and expenses will be reduced, the rational production and recycling resources will be promoted.

The essence of German circular economic law is that it provides that all the waste should not recycled as secondary raw materials. The wastes are produced in and after all production process, even in the consumption process, as long as they are not disposed. In view of the increasingly serious problem of waste disposal, waste economy requires producers and consumers to be responsible for recycling their products and residues. Consumers are required by law to send the product after use to the specific locations or for reuse. Therefore, the German scholars understand the waste economy as the material economy. They consider that waste use firstly is a process of material change, which is the same as other material change process, in which a material of designable quality and characteristic is required to generate. The material economy is one part of environmental operation with the aim to produce and use renewable material in the production chain. That is, material economy will not produce waste in the producing and using process (Hofmeister Sabine, 1998).

Government laws and regulations to constraint the environmental pollution promotes corporate to use the development of environmentally sound as one of the indicators. Germany made the strict environmental protection requirements for enterprises, especially in production-oriented enterprises, whose establishment must have the environmental conditions. For example, enterprises must have effective waste and sewage disposal facility and take measures to assure effective production process and avoid waste production; electrical manufacturers must establish the electrical recycling systems of waste treatment. Moreover, the German government established a special institution to monitor the business waste disposal and circular economic development. Only after manufacturers demonstrate the oversight institutions their ability to recycle the waste products, can they be allowed for production and sales. Waste companies must report the waste type, size and disposal measures to the supervision sector. Meanwhile, the waste producers, with annual hazardous emission greater than a certain number, are obliged to submit the program of waste disposal for the management by relevant sectors.

2. JAPANESE ENTREPRENEURSHIP AND CORPORATE CULTURE

Honda is one of the world famous mobile manufacturers. Early in 1921, its founder Soichiro Honda, was only a worker in the automotive repair shop. In 1927 when he opened an independent auto repair shop, the plant was about 7 meters wide, covering an area of 16 square feet. In the place where 4 cars can fully occupy, the staff was just 2 persons: Soichiro Honda and one apprentice. In such a primitive condition, Soichiro Honda turned Honda into an evergreen multinational company with continuous learning, innovation and commitment for excellence.

After World War II, the Emperor of Japan announced its unconditional surrender, and the end of war was declared. After that, Japan was in ruins. In Japan, there have always been no advantages in natural conditions. The defeated Japan had neither the political and military advantages, nor economic and technological advantages. History shows that Japan now has been rejuvenated, and the spirit of learning is the first step to prosperity in Japan. Peter F. Drucker, known as the father of management, said, "I have always been attracted by the unexpected success of Japanese. In my opinion, to understand this success is the key to know Japan. The more I explore this question, the more I get confused. However, there is one point getting more clear, that is the basis for Japanese success is that they have the unique ability to use external tools, whether this tool is a social system or the material technology, the Japanese value system has accommodated it for their service goals" (Drucker, 2002).

2.1. The Entrepreneurship of Soichiro Honda

As the company leader, Soichiro Honda was trapped in extreme difficulties after the defeat of Japan. But he never gave up the initiative to study the advanced technology and management experience of foreign modern auto companies. In 1952, when he ended the 46 days investigation of American industry, he thought the easiest way to shorten the 10-year-gap was to use the same advanced machines they were using. Thus, the 10-year-gap can be shortened within six months or one year in one fell swoop. If the machine bought from them was not put into rush use, but rather got functional improvement, the machine efficiency would be enhanced. If the trial was successful, Japan might not only catch up with Europe and America, but also perhaps beyond them. Then he invested 450 million yen (Honda Motor Company only had a registered capital of 600 million yen) to buy the advanced machinery in the United States, Switzerland and Germany. And they learned the world's advanced automotive technology without wasting time. At the same time, he always believed, "the value of business existence lies in their contribution to society". In his opinion, "Companies should not just give priority to profit and forget social responsibility. If a company cannot do it, it is not qualified to establish the brand." (Daxiayingzhi, 2005). From 1948, when the company was established, the awareness of social responsibility was spread through the top to bottom, from the beginning to the end (see Table **5.5**).

Soichiro Honda devoted himself to the cause with strict self regulation and took care of his staff with less interest of profit. His identification with the company set the basis for a prestigious, powerful and competitive management team, and also made it the core resource of the lowest cost and greatest effect. His mind and vision, practice what they preached and self-regulation between Japan and Europe/America continuously affected the staff around and passed from the older

employees to the new employees. Thus, the tone of enterprise climate—innovation, hard work, optimism, responsibility—were created, corporate values and common way of thinking was formed. Honda's spirit can be concluded as three points: to be creative, not to imitate others; to be global, not limited to a narrow area; to be accepted and enhance mutual understanding. This culture value eventually enables Honda to become a powerful company in the world. In 1995, Honda's net sales were about $40 billion and the world wide employ number reached 92,000.

Table 5.5. Historical Context of Honda Entrepreneurship, Philosophy and Practice.

Time	Soichiro Honder's Entrepreneurship, Philosophy and Practice
1951	He said to his apprentice, "Before the guests drive to the repair workshop, they have been distracted by the fault and filled with uneasy and distrusted emotion. At the end of our work, a word of 'repaired' is not enough. It is very important to explain to the guests which fault is repaired by which method. Moreover, we should clean the car and adhere to delivery time. If we cannot do this, we cannot be called to do the good repairs."
1960	He said on the establishment conference of Honda Research Institute Independent Joint Stock Company, "In the fierce competition, if we do not seize the time to come up with our new creative thinking, we cannot beat our rivals in the world. Our mission is to innovate and speed up development."
1966	Japan's transport ministry limited the vehicle exhaust emissions (about 11 years later than the United States). In the same month and same year, Honda technology research formed the "AP research" (Air Pollution Research) research team. When they developed a new engine, they have taken clean atmospheric standard and new car design into consideration.
1970	Japan announced the "Muskie Act". This unprecedented stringent restrictions on vehicle exhaust emissions firstly encountered fierce counterattack by three big auto makers in the United States. The president of Ford Motor Company made it clear that they could not reach the Muskie Act standards. Starting from the improvement of N600 engine start, AP tried to reconsider all of the parts design and carried out several tests.
1971	Honda successfully developed the engine to meet the exhaust emission limit.
1972	Honda released the entire content of Honda CVCC low-emission engine and presented a paper to the United States Environmental Protection Agency. "For the issue of Muskie Act, we CVCC engine has successfully reached the standard. We are pleased to provide the research result to all the interested parties, irrespective of nationalities." At the end of the year, CVCC engine technology was highly acclaimed both nationally and internationally. Their technology has met the "five year value provided by Muskie Act".
1973	At the age of 65, he expressed his message at retirement, "The young people of the institute told me that emission measures were not the company's standard issue, but the responsibility that automobile manufacturer should take. I feel that the society is progressing. Now our company has entered a new era which needs new value, close relationship between business and society and a very innovative management style. In order to cope with the increasingly strengthened corporate responsibility and business commitment for natural environment protection, our company needs to have a young tactile and force."

Source: Daxiayingzhi, 2005.

2.2. Development of Honda Corporate Culture

In order to respond to the early 1990s environmental issue, Honda strengthened the world wide environmental participation. In 1992, Honda adopted the "Rio Declaration on Environment and Development", which required each Honda branch will strive to assess the environmental impact of its activities. In its product design, the resources and energy use should be reduced, the resources should be recycled and used efficiently. According to the corporate culture, Honda stressed that each stakeholder (production worker) should take the responsibility in the design and implementation of environmental activities (World Resources Institute, 2003). As what Honda responded to the "Muskie Act" in 1971, this approach met the requirement of "Extended Producer Responsibility" published by Japanese Environment Ministry in 2001 (see Table **5.6**).

Table 5.6. Extended Producer Responsibility.

Definition	It refers to such an environmental policy: In the entire product life cycle, the producer's responsibility is extended to the later stage of consumer use, and the product physical and economic responsibility should also be taken. In particular, extended producer responsibility can be divided into: (1) producer responsibility throughout the product life cycle to minimize the environmental load in designing; (2) the producer in product design stage can not exclude the physical and financial responsibility for environmental impact.
Main function	Waste disposal cost, all or part of responsibility are transferred from local governments and general taxpayers to the producers.
Four main targets	1) reduce the source occurrence (natural resource preservation and material input reduction) 2) inhibit the waste occurrence 3) design more environmentally friendly products 4) promote sustainable development of uninterrupted material circular chain system.
Effect	To pressure the upstream industry in material selection and product design; Give the producers a clear signal to internalize the environmental costs.
Shared responsibility	In the entire process from production to disposal, all relevant subjects should share responsibility, which are the basic elements of "extended producer responsibility".
Examples of specific policy approach	1) the recovery of waste products 2) margin (deposit) system 3) set up standards for recycled products.

Source: Wei and Tong, 2006.

HAM, Honda subsidiary in the United States, emphasizes its environmental performance in its unique way. It fundamentally solves the environmental problems by focusing on efficiency, flexibility and creativity. The specific implementation steps include: participating the voluntary environmental programs

initiated by U.S. environmental protection agency; forming a new environment member function by lean production; taking proactive measures to reduce air pollutant emissions and meeting the minimum (or even below)value required by regulation. The large investment of new techniques has reduced 2/3 atmospheric emissions (per unit basis). These techniques include reducing ozone-depleting emissions and introducing a new paint process.

Honda of Guangzhou China also goes beyond the Chinese government environmental regulation standard. Currently, Guangzhou Honda has received the Certification for China Environmental Labeling Product from the Environment and Development Center and China Environmental United Center of the State Environmental Protection Administration. It has achieved success both in the cooperation of "environmental protection and energy saving" with the government and in its own environmental management.

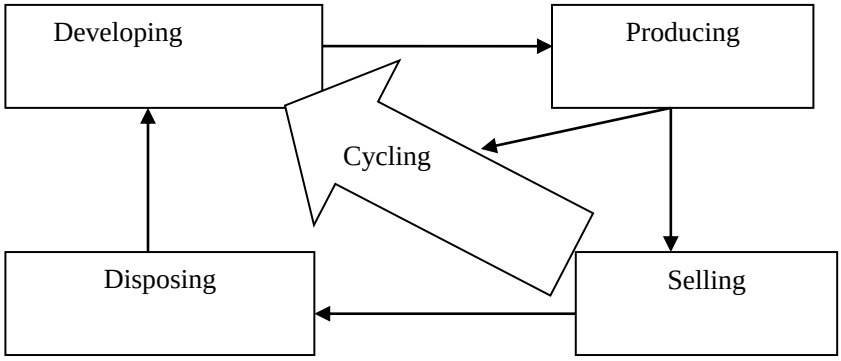
The continuation of corporate culture involves two concepts: one is stock and the other is increment. The stock is accumulated in the long term development and proven to be the excellent traditional culture. In Honda, it means excellent production and responsibility for the customers, staff and the society. The increment refers to the competitive advanced culture actively explored in the new market and proved by the new practice. In order to reduce the 10-year-difference from the European countries and the United States, the Honda technology institute is courageous to challenge the "Muskie Act" with bold innovation and makes slightly better contribution than Ford, the U.S. famous company. Now, Guangzhou Honda has assumed extended producer responsibility, namely, it has taken the responsibility of the entire life cycle of automobile manufacturing, especially the responsibility for the vehicle recovery, recycling, and disposal (Lindhqvis, 1998). Thus corporate culture is transmitting, recycling and updating in the life circle (see Fig. **5.1**).

2.3. Analysis of Guangzhou Honda Environmental Culture

From the performance of Guangzhou Honda, environmental culture combines the traditional cultural advantages and the new concept of environmental system with the feature of integration, harmony and permanence. And it is an advanced and healthy corporate culture with powerful functions and values (Ren *et al.*, 2005).

Firstly, it will be conducive to achieving corporate benefits. Enterprise environmental culture guides them to conform to the trend of times, follow the law of market economy and environmental law, and avoid the punishment of economical law and ecological environment. The environmental product will have higher quality and better function by the guidance, which meets the requirement of more customers. Moreover, most consumers having environmental awareness

are willing to pay more. And this is instrumental for enterprise to expand market share and gain greater benefits. As the environmental industry is dominating international market competition, more attention is focused on environment and connected construction and production project is the priority target, when governments, banks and various social organizations carry out lending and investing. Then, these enterprises will obtain tangible or intangible preferential policy support and actively cooperate with government. Enterprise environmental culture respects producer, customers, society and natural environment. It helps to create good working and living conditions, stimulates employee's creativity and enthusiasm, and brings greater economical benefits. Enterprise environmental culture promotes the enterprise to use new production management and scientific management methods to enhance cost efficiency, new growth point and economical development.



Developing: design recycling material and considers loading/unloading
Producing: design and use of recycle material
Disposing: dismantle abandoned vehicles and deal with residue
Selling: repair, replace and retrieve
Cycling: technology feedback

Fig. (5.1). Life Cycle of Automobile and Recycling.

Secondly, it will be helpful to set up corporate brand and establish corporate image. Along with the growing concern on environmental issues, the production and business operation of enterprises have received more attention. Increasing customers are willing to purchase the quality goods produced by enterprises with good environment discipline. After eight years of development, Guangzhou Honda has attained the support of customers and markets and set up responsible corporate image. From 2000 to 2006, Guangzhou Honda enterprise has donated more than 3 millions of RMB, planted trees, and supplies environment monitor

cars in Guangzhou, Beijing, and Hebei provinces. The achievement improved environmental awareness of the public. Thus, the image of "Chinese Best Corporate Citizen" has been rooted in their minds.

Thirdly, it will be effective to enhancing international competitiveness. On March 2005, automotive research specialist J.D. Power & Associates announced a new research quality (IQS) report 2004, Guangzhou Honda Accord, Guangzhou Honda Fit and Guangzhou Honda Odyssey achieved top one in their respective segments. They are proved to meet the Euro IV emissions standards and realize 90% of automotive materials recycling utilization. Undoubtedly, there ecological products are world class. Now green trade barriers are stricter for trade protection, which brings more challenges for China. Comparatively, western countries have better environment awareness and superior formulation and implementation of the environmental standards. While in China, the "harmless" management system has not been set up, because of less attention. Environmental culture requires that the enterprise to adopt the environmental production methods and ensure their activities are in line with international environmental standards. This will reinforce the international competitiveness of enterprise and ensure smooth entry into international market.

Fourthly, it will be constructive to sustainable development. Enterprises are the engine of modern productive forces, the most dynamic factor of social development. It is enterprise that decides the new value and behavior and keeps advanced in the gradual social developing. As a new growing point and driving force, the leading corporate culture will promote the development of social culture. When the low-pollution technology of Honda's CVCC engine met the standard of Masiji Act of the United States, Japan government didn't pay enough attention, because the whole society only began to concern about clean air. And now, Japan is far ahead of the other countries in environmental standards. Guangzhou Honda enterprise achieved the ISO 14000 certification ahead of schedule of Guangzhou province, and now it is significant for Guangzhou to be the national demonstration zone of ISO14000 certification. The ultimate target of enterprise environmental culture is to facilitate social culture development, improve the sense of environmental responsibility of every member of society, upgrade the ideological realm and overall quality of people, and move forward the sustainable development of the society.

3. XEROX'S ENVIRONMENTAL LEADERSHIP PROGRAM IN THE U.S.

Xerox was one of the world largest manufacturers of office equipment in the early 1990s. It specialized in personal copier market, copy center and Xerographic printer centre. In 1990, Congress sanctioned the "Pollution Prevention Act of

1990", which demanded on the reduction of waste emission and resources consumption by companies. Xerox began to carry out the environmental leadership program to coordinate the action of design, purchase, distribution and marketing aspects in solving environmental problem.

The first stage of the program involves five plans: employee involvement plan, waste control and recycling plan, asset management pilot plan, supply plan, and cartridge recycling plan. The Environmental Leadership Steering Committee is responsible to supervise and guide. The environmental plans are managed according to the quality control of Xerox. The lease measure and replacement plan, which have been implemented for several years, promoted the re-use of machine in Xerox. To some extent, the Xerox product was designed in an integrated management. And different types of machines in the same product line only need to be replaced by a few parts. New environmental plan clearly defined that product design should indicate the spirit of reusing, remaking and recycling. Additionally, the strategy to improve the number of product and parts reuse should be formulated. The team of Environment, Health and Safety (EH&S) must plan to save in the medium and long term execution. Data show that Xerox had saved 10 million to 20 million dollars annually due to reducing the number of new components and recycled products. McKinsey, head of EH&S, believed that $250 million would be saved annually if the plan was proceeded in a larger and more comprehensive range (Benchmark, 1991). "We swear, as a company, we will never stop exploring the environmental protection and we attach the same commitment as we do with our customers and shareholders" (Allaire, 1990). This is the strong support given by the top management.

In the end of 1990, the environmental leadership program was formally begun to implement. The heads of main functional sectors and global operation committee composed the program guide committee. The EH&S sector management role is to manage the program, provide report to the guide committee and get the information from the governments, suppliers, customers, rivals, who challenged Xerox in the environment aspect. McKinsey added a coordinator position to the team and appointed Hill, an environmentalist as the coordinator. He was responsible for improving the staff environmental awareness, providing guidance for the waste management system of staff office and managing the green database for staff participation of environmental projects (Benchmark, 1991). Additionally, there was a special position of the environmental design and resource conservation department manager. He was responsible for improving the company environmental design engineering and technical activities, connecting with suppliers, government departments, guilds, environmental groups and provider network, and supervising the regulation trends of Washington.

3.1. Asset Management

The essential concept of environmental leadership program is asset management—product and inventory control in any stage of product life cycle. Especially in the final stage, the damage to the environment should be reduced to the smallest degree. As for Xerox, the asset management means the process of asset re-use. In other words, recycling assets (machinery, parts, components and packaging) are recycled to return to the original state or to be turned to another state for the recovery of the original accessories. The process is very complicated, it requires the involvement of design, construction and improvement activities.

3.1.1. Quality Improvement Team

In order to find the most effective asset management approach, Xerox organized the asset management quality improvement team. The team members met every 6 weeks to investigate the asset management business practices, which include the inadequacies of reuse and recycling of equipment, waste components, equipment stock for some time, inventory control problems, accessories and parts state, and recycling center warehouse equipment. To promote the most effective improvement, the team made the asset management order in terms of the EPA principle: reuse, repair or reprocessing, recycling and abandoned (landfill and incineration).

"We will try to reuse or recycle waste generated from operating activities" (Xerox, 1991). This is the order carried out by Xerox asset management. The team established the following target for the program: strengthening the force to turn the nonprofit assets into profit assets with the aim to achieve maximum return on assets (Xerox, 1990). There is a significant economic opportunity in recycling equipment, change of use method, disassembly and parts repairing. Xerox has over 100 million parts in worldwide repair or reconstruction sections—if these parts are reproduced, it will cost $200 million, and the cost of these parts amounts to 2% of the cost (Benchmark, 1991). Therefore, the potential savings in asset management is very huge. According to McKinsey, the improved asset management has the most important reason for the environmental leadership design to increase the cash flow concerning the environment. According to the quality improvement team, $80 million will be saved in the next 18 months. Therefore, it a great economic opportunity, which is even more important than the environment.

3.1.2. Asset Recycle Management Organization

Asset Recycle Management Organization (ARMO) is a special group of Xerox to execute the asset management strategy. In particular, ARMO is the global business to provide strategy program, new product technology support and

environmental information. It aims to help enterprises and customers conform to the environmental standard and make profit by using old parts and equipment and thus meet the enterprise target.

According to the recommendations of the quality improvement group, Xerox received increased revenue by such activities as the used parts removal, equipment maintenance, and spare parts and materials recovery. And the recycling recovery possibility is very limited for those who do not have the recycling design. Xerox's goal is to minimize the amount of landfill waste material, so the new product design will also be involved in the priorities. In 1997, the company aimed to create new products to reduce the factory's waste recycling ratio to zero; primary recovery areas will be optimized, and the use of closed recycling and reuse of material will be practised as much as possible. In the first 12 months program operation, the total savings amounted to $50 million, due to the reduction of logistics, inventory, raw material procurement.

Asset management requires new design guidelines, operation principles and recycling improvement strategy. ARMO's first measure is to recycle the internal machine and encourage the original equipment suppliers or contractors to recycle parts with quality control of the premise. Also like the EH&S department, ARM established supplier management measures.

Previously, the company let engineers study the recycling problem. Now these engineers can cooperate with the design team in advance. Therefore, the product recycling capacity can be better integrated into the product delivery process. After the manufacturing, the recycling ability can be completely reflected.

ARMO and Xerox other organizations have set up standards and guidelines of raw materials, principles and evaluation tool of designing. They found that it had huge strategic value in the development of quantitative tools for recovery, software models, other qualitative instructions. The environmental design is very significant to the plan.

3.2. Design for Environment

Design for Environment (DFE) means designing products in accordance with pollution prevention and resource protection. The product which starts with successful environmental design will produce minimum pollution in the producing process and input activity. And in the pre-launch, a flow path of recycling and reuse is well-designed, the corresponding recycling system is already in place.

In order to gain the technological information and reference standard, Xerox took part in American Electronics Association. With the support of Xerox, AT&T, IBM, Polaroid, Hewlett-Packard and other companies, American Electronics Association proposed the concept of environmental design. Meanwhile, it proclaimed, "The implementation of environmental protection will help your company manufacture environmentally friendly products, while maintain the product price/performance and technical features" (American Electronics Association, 1992).

Xerox management believes that the combination of pre-production activities and environmental design can be achieved by long-term plan, architectural standards and product specifications. Environmental design can be strengthened and coordinated by mandatory review in the entire process of product, focusing on a set of design guidelines, design assistance and design phase. Thus ARM and other organizations of Xerox began to develop a set of tools.

They developed raw material environmental index, which was utilized to measure the raw material compatible extent with the environment. Material guide suggested the design group limit the material type. The product design draft used detailed identification and specification rules, which used to be the handbook for manufacturing. The recycling rules were at great length for the spare part recycling potential and method. Environmental disposition provided the emission method of waste disposal, which conformed to recycling rules. In order to maintain these rules, it provided the instruction on how to deal with "end of life" of the raw material and developed a new electronic database.

In addition, product life-cycle cost model was also on the way to be developed. The model is to work out the cost differences of different parts, and to figure out whether the project meet the target value model. When the spare parts life cycle model was adopted, it could be served for comprehensive asset management, including new parts manufacturing process, raw material management, recycling, technology, distribution and services. Furthermore, it could calculate the residual cost of waste product and spare parts produced by Xerox for its customers. The model output was the unit cost of production which contained a variety of factors. This could not only manifest the asset management strategy, but also manifest the economic gains and losses (Federal Register, 1992).

3.2.1. Design Reusable Cartridge

Xerox cartridge is a small internal part, which is composed of significant xerographic form required by small copiers. To make sure the copy quality and copier liability, the cartridge should be changed regularly. From 1998, Type 1012 copier began to use replaceable cartridge. At that time, the designer did not take

reuse and recycling into consideration. Therefore, the cartridge is usually thrown away after use.

Thus, the development of reusable and recyclable cartridge became a fine example of Xerox asset management. Managers found that the cartridge production sector can provide an independent and comprehensive plan to test and improve the environmental protection concept. Because of small number of the spare parts and the increasingly high voices of customers for recalling cartridge, some competitors (such as Canon) intended to implement promotion to achieve product differentiation.

In 1988, the Xerox designer used the method to localize the small copier designed by Fuji Xerox and then carried out the production and sales in the United States. The designer's main change is to reduce the number of spare parts. Redesigning cartridge is the process core part. The afterwards developed 5018 type and 5028 type cartridge all comply with the new total quality management method. Manufacturing engineers, product design team and production team take part in the design improvement activity.

The first challenge the redesigned cartridge faced encountered to identify the new cartridge and reusable cartridge reliability and failure rate. The high cost old parts were reused in an exploratory program. The team made reliability examination on 10000 cartridges. Failure rate data collection took some time within the company and product markets. In this way, the team developed a low cost cartridge recycling program and recycling principles, which maintain the original quality of the new design.

The team strived to find out the best methods of the old cartridge collection, dismantling and recycling. One option is to collect cartridges, and then continue with recycling or production. Another option was to claim back the parts in one place according to established guidelines, and then sent the reusable parts to the production line, the remaining parts would be sent to the recycling sector. The plastic and other materials would be sent to the reusable department. The group's strategy was to produce copier cartridges in Webster of New York, Wenli of Netherlands and Japan (one plant of Fuji-Xerox Corporation) and implement recycling in the United States and Netherlands.

The result of saving and cost ratio showed that the initial cartridge recycling activities could not reach the breakeven point because of the product design and recovery network constraints. With the fierce market competition, environment became increasingly important in customer preference policy, and the company hoped to expand the recovery market of raw material. Consequently, the project continued to go ahead. Soon, these factors made the company profitable.

According to the senior managers, they did not feel contradictory in their minds. And they believe they will benefit from the performance in light of the environmental standard measurement.

3.2.2. Development of Plastic Recycling Strategy

As one part of environmental leadership program, Xerox should try every possible means to compress all the materials (metals, packaging, paper, and plastic) and then reuse them. To achieve such a large program need to set up a recycling network, improve material identification and increase transparent recovery (recycling from all sources) and closed recycling (from the Xerox source) material usage. The program goal was to minimize the amount of waste production and maximize the recovery and recycling levels of spare parts and equipment.

3.3. Xerox Internal Activities

For the plastic materials, the company aimed to use 25% recycled plastic in 1995 and 50% recycled plastic in 2000. Firstly, Xerox implemented these plans in the company. The technology team tested the appropriate ration of the "recycled plastic" added in various components. They assured that the use of recycled plastic did not affect quality.

Xerox also printed the global unified identity on all the plastic parts, so that the customers could easily take part in recycling activities. Previously, it is difficult to promote recycling activities due to the absence of plastic type identification and the affected characteristics when various plastics were mixed together in recycling. The plastics recycling value was improved after the printed recognizable logo. Since the problem was caused by using different plastics, the plastic recycling team developed a "Guide for Materials" Program. Apart from special purposes, the guidelines advocated to the plastic formula down to 50 kinds (80% of which would use less plastic parts), while there were 500 species of the plastic currently used.

Xerox encouraged suppliers to participate their program and study the recycled plastic market. First, the company increased the number of plastic parts in its order. Although Xerox had a way to get suppliers to comply with this change, the latter was very reluctant, because they worried at the sales of new raw materials. However, after two years of communication, the suppliers changed their attitude. The cartridge and other programs helped more and more suppliers use the recycled plastic.

It is of great importance to develop cooperation within the industry for recycling network and technology. And some computer and business equipment

manufacturers have begun the co-operation with the American Plastics Council. Company executives believe that only those plastic manufacturers who care for their public images will be considered to be co-producers. The harmonious relationship between the original equipment manufacturers and producers, especially the partnership between the plastic manufacturers and recycling companies, can promote recycling activities. Meanwhile, the component of the line also makes the government believe that electronics companies are seriously considering solutions to the environmental problems. Based on the current available recycling technology of plastic box, the company expects to set up plastic recycling network and technology facilities, which can save 5 million to 10 million dollars for Xerox. This is an important part of the recycling activities in the environmentally-friendly design.

3.4. Xerox External Relationship

Xerox is active to participate industry associations and comparative activities. Everyone in the company believes that they will not lose their competitive advantage as far as they remain have a positive attitude. In their opinions, this advantage comes from practice instead of concept. Xerox maintains advantage by quick action. According to the top management, environmental issue is a strategic issue of the company development, and Xerox must take the lead in this aspect. Through quality leadership program EH&S department learned that it was very important to develop a strong external communication plan.

In the market of large copiers and printers, Xerox is second to IBM and Eastman Kodak Company. Kodak has just teamed up with Canon to create a new product line. In this product series, the two companies frequently share environmental technologies. Kodak has launched three new copying equipments in the U.S. market: new type, new made and new recycling equipment. The new made copy equipment used the reprocessed parts and the recycling parts had a considerable proportion in the reuse equipment. IBM has a great recycling and waste control program, and has developed a recycling and recovery plans for obsolete equipment in Europe. Comparison with rivals is very helpful for Xerox to make environmental plan. Comparative activity is also an essential part of quality management plan. However, the comparative activity is not limited to competitors. Xerox also pays attention to activities of other organizations, such as BMW, Volkswagen, 3M, chemical products manufacturers associations, *etc*.

Xerox is always the important client of its suppliers and it takes this advantage to make cooperation with plastic product supplier. This not only expands the proportion of recycled materials in the raw materials, but also improves the recycling potential. In the two years of 1991-1993, Xerox has promoted suppliers

to design products in accordance with recycling standards, improved identification and raw material identification system.

Relationship with the government can either facilitate or hinder the resource protection of electronic office equipment industry and asset management. Xerox once effectively persuaded the federal and state government to restrict the equipment procurement and recycling, based on the notion that "the government should become a model for the customer". In October 1991, President Bush signed the No. 12780 Presidential Decree, requiring government departments to purchase products made with recycled materials. Federal Procurement Policy Office clearly specifies a recovery of federal procurement policy. Later, the Office issued a directive calling for the federal government conduct timely purchase priority plan for low cost product in the procurement of environmentally friendly and energy saving products and recycled products. Xerox lobbied the government to allow the voluntary use of "1992 National Environment Policy Act" in terms of the office equipment energy efficiency standards. The company wishes the government to "establish reasonable regulations according to the voluntary program rather than mandatory standard" by means of the promotion of its achievement (Azar, 1993). Xerox thinks that the mandatory standards restrict its product activity and improve potential capacity. Some states set limits on the old equipment purchases. Xerox's lobbyists are trying to persuade the states to simplify pollution control as well as procurement requirements.

In 1992, Poper poll showed that 78% Americans believed that to some extent corporate environmental measures would affect the products they would buy. The information of professional journals and office equipment magazines demonstrated that now the customers had increasing demand. They no longer just focus on paper recycling, but rather began to pay attention to cartridges, toner containers and other recycling equipment. In order to verify and understand the information, Xerox conducted a wide range of surveys and market analysis with the help of customer advisory groups. The top management thought that in order to successfully promote the products they must understand the customers' requirements and also respond to a variety of mandatory requirements. Xerox found that a small part of customers will make decisions according to environmental protection elements. Further studies indicated that if the recovery system is very convenient and Xerox was ready to provide funding, these people would be willing to participate in recycling activities. The company developed the reusable cartridge, which started the recovery. Xerox also hoped to expand the constructive activities through department copier programs.

4. SUMMARY

Through the enactment of a series of laws and corresponding measures, the German government achieved the changing pattern of economic development, the industrial restructuring and the increase of production technology level and energy efficiency. Gradually, it solved the problem of pollution in the process of industrialization. Especially in the waste management, Germany government has taken the leading role in the world. Since the mid 1970's, the discussion carried out in Germany on the waste disposal program has been scientific and pragmatic. The continual improvement of laws and regulations enabled the contradiction between the economic development and environmental pressure to be eased. Waste has been cleared environmentally, corporate environmental behavior has been shifted from the end treatment to the whole process control, the industrial production and consumption adverse effects on the environment has been under control within a certain time. The material recycling has been promoted and the human energy needs from the environment has been reduced.

Japanese company's spirit of learning and innovation is admirable. From a negligible small business into today's world-renowned multinational company, Honda's development is inseparable from its founder Soichiro Honda, who upheld the sense of responsibility and innovation spirit. The original meaning of Japanese "learning" refers to "imitation", so Soichiro Honda led his company always imitate the advanced technology and practices. However, their learning does not stop at imitation, at the same time they added with their own things. From imitation to creation, they put their own talent and learned things together, so the final product not only has the external products essence, but also maintain their integrity and the traditional characteristics. The resulting accumulation of corporate culture and the value of "contribution to society" affect every employee. The Honda corporate culture remains intact new, keeping pace with the time. It is reflected in the practice from providing quality products for the society to realizing the "zero emission" to the outside of the factory. This enables Honda to keep in good condition in the complex and high economic competition and gradually achieving the development target toward excellence.

U.S. Xerox environmental leadership program can be the paradigm of corporate to take proactive measures rather than rely on government management. Xerox total quality management encourages full participation, advocates choosing materials to meet reducing waste emission, environmental protection standards, improving packaging and taking responsibility for waste disposal and using Xerox recycled products and equipment. Improved asset management makes Xerox useless assets between the internal and external departments maximize effectiveness. "We have no reason not to protect the earth…This is also the safest and most reliable way to

maintain the long-term profitability." It is the top management commitment that gets Xerox awarded the 1993 World Environmental Center Gold Medal for the achievements in the international business environment. It is also the inherent power for the company to make further target of zero waste.

It is the government laws and regulations, entrepreneurial spirit and corporate culture, and corporate self-discipline in the advanced countries in the world that play an important role in the entire enterprise system to improve environmental management systems. From the perspective of SDS, there is a significant gap between developed and developing countries in time and space and a clear leading advantage in the development levels as far as the corporate environmental management experience is concerned. On the one hand, the former established a reference for the latter; on the other hand, the former led to further reflection which inspired the newcomers to avoid the old road of pollution first and treatment second. They should start from the truth and keep balance between the economic development and resource and environmental maintenance.

DISCLOSURE

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REFERENCES

Allaire, P. Xerox Corporation and the Environment. A Message from the CEO, 1990.

American Electronics Association. The Hows and Whys of Design for the Environment. A Primer for Members of the Electronics Association, p. 3, 1992.

Azar, J. (1993). *An interview with Azar.*

Benchmark. (1991). Xerox and Environment. A Quarterly Magazine for Xerox Customers, p. 2.

Benchmark. (2005). Soichiro Honda Legend. Hangzhou: Zhejiang Renming Press.

Drucker, P.F. (Zhang Wei translated). (2002). *Innovation and Entrepreneurship.* Shanghai: Shanghai Renmin Press.

Federal Register. (1992). Vol. 57, No. 27, November 9.

Gang, X., Dong, Y. (2005). The Inspiration and Reference of Germany's Development of Circular Economy. *JiangSu, Science. Technology and Economics, 18*(1), 41-43.

Hartwig, D., Meyerholt, U. (1994). Die Entwicklung des Abfallrechts von der Beseitigung zur Kreislaufwirtschaft, Entwicklungen und Probleme der Abfallwirtschaft vor dem Hintergrund des geplanten Gesetzes zur Vermeidung won Ruckstanden, Verwertung von Sekundarrohstoffen und Entsorgung von Abfallen, Fachbereich Wirtschafts-und Sozialwissenschaften: Arbeitsberichte, 129. Luneburg: Universitat Luneburg, pp. 2-9.

Huang, H., Liu, J. (2007). *Germany Circular Economy Research* (pp. 50-55). Beijing: Science Press.

Jie, W. (2003). *Science of Systematic and Dialectics.* Beijing: Renmin Press.

Lindhqvis, T. (1998). What Is Extended Producer Responsibility? In Extended Producer Responsibility as a

Policy Instrument—What is the Knowledge in the Scientific Community? International Seminar, Sweden.

McCann Erikson Harris Research Center. (1990).

Sabine, H. Von der Abfallwirtschaft zur okologischen Stoffwirtschaft: Wege zu einer Okonomie der Reproduktion, Opladen: Westdeutscher Verlag, p. 70-301, 1998.

Xerox Corporation. (1990). *Asset Recycle Management: Asset Recycling—The Future is Here. Xerox Corporation. (1991)* How Xerox Applies Quality to Asset Management.

Wei, Q., Dong, S. (2006). *Japanese Circular Economy.* Shanghai: Shanghai Renmin Press.

World Resources Institute. (2003). *The World Well-known Business Management and Environmental Case.* Beijing: Qinghua University Press.

CHAPTER 6

Chinese Model: China's Corporate Environmental Responsibility

Abstract: Since 1970s, China's corporate environmental responsibility developed stage by stage. China first convened the national environmental protection conference, where environmental issues were officially discussed in 1973. The first New China's environmental protection law was promulgated in 1982 and in 1992, the CPC central committee and the state council jointly published "China Top Ten Countermeasures on Environment and Development", which are related to CER. Since the 21st century, there have been a growing number of words about environmental protection and sustainable development, which are essential to CER. Practice shows that the following three Chinese companies have made good achievements in implementing CER. Tong Ren Tang in Beijing introduced Sialon in the field of medicine. It effectively protects the plateau grassland resource and maintains the grassland environmental balance. The Steel and Iron Company Jinan establishes the recycling economy development model, minimizes the production and consumption pollution, and conducts innocent treatment of waste resource. It acquires greater economic and environmental benefits at lower cost. By means of green business growth, Inner Mongolia Elion Resources Group turned desert into fertile land and oasis, and "sand harm" into "sand benefit". It has made tens of thousands of peasants rich. As SDS indicates, the sustainable development of Chinese enterprises is deep rooted and ancient Chinese heaven-huma--coordination idea is firmly fixed in Chinese culture. It is a strong inside calling for today's "environmentally friendly" enterprises development. When Chinese companies communicate with international partners, they need to participate in the international exchange more actively, hence furthering the initiative and the right to speak.

Keywords: China, Corporate environmental responsibility (CER), Cultural root, Development, Heaven-human-coordination, Practice.

With the perspective of SDS, the system's movement is dynamic(Wu, 2003). China's development of CER shows the dialectical unity of the past, present and future. Reviewing the history, affirming the achievement and expecting the future comprise the dialectical attitude that China's enterprise managers should have.

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1. THE DEVELOPMENT OF CER IN CHINA

The development of CER in China can be classified into the following 4 stages (Peng, 2012).

1.1. 1970s

In 1972, the United Nations conference on human environment was held in Stockholm. It opened a window on environmental protection for China. At first, the Chinese delegation was just a "Ministry of Health", because, at the time, the socialist country was regarded to have no environmental problems, and there was only a matter of environmental hygiene. Later, Premier Zhou Enlai said, Environmental protection involves all aspects of industry, agriculture, cities, rural and national economy. The Ministry of Health faced with difficulty in coordinating these aspects. So the new group delegation included the scientific experts in plans, diplomacy, metallurgy, petrochemical, light industry, health, nuke industry, agriculture and other departments in Beijing and Shanghai, and it became a large delegation across political and academic circles. The Stockholm Conference on Human Environment made China highlighted that there were also environmental problems in the socialist China. In the 1970s, China began to make a difference in the environment, just focusing on the macro level, leaving the enterprise environment out of focus. In 1973, China first convened the national environmental protection conference in the name of the state council, which made the environmental issues an official agenda.

1.2. 1980s

In 1982, the first New China's environmental protection law "the People's Republic of China Marine Environmental Protection Law" promulgated, marking Chinese environment problems in the judicial process. However, the whole landmark environmental laws did not mention the problems existing in the "enterprise" in the protection of the Marine environment or shall bear the responsibility. But that situation quickly improved. In May 1984, the state council issued the "Decision on Environmental Protection Work" (1984), which indicated that large and medium enterprises should build environmental protection agencies or designate special persons to do environmental protection work as needed. In 1989, "The Environmental Protection Law of the People's Republic of China" was promulgated. The environmental protection law means that the environmental problems are responsibilities that should be borne by enterprises in several places. For example, in Article 24 and Article 25: units that produce environmental pollution and other public hazards must be incorporated in the plans of environmental protection work to establish an environmental protection liability system. Enterprises should choose equipment and processes with high resource

utilization rate and low pollutant discharge, and adopt economical and reasonable waste comprehensive utilization technology and pollutant treatment technology. "Environmental Protection Law" reflected the idea of a leap; it not only clearly and correctly pointed out the environmental problems, such as waste gas, waste water, waste residue such as environmental pollution, but also pointed out that enterprises should be responsible for this *i.e*. for energy conservation and emissions reduction along with pollution prevention. This means that by the late 1980s, environmental problems and the concept of responsibility concepts were given attention.

1.3. 1990s

The notion of corporate social responsibility arose into China in the 1990s. After short-term resistance, environmental protection and sustainable utilization of resources of corporate social responsibility also took root in China. In particular, the green "trade barrier" constructed by developed countries in the west has brought China a chance to localize the concept of corporate environmental responsibility. In the mid-1990s, "green barriers" brought huge export resistance to domestic manufacturing companies, which could not be ignored by China, as China relied heavily on export economies. So we began to reflect on whether to choose a more environmentally friendly trade policy, and not to deal with it, but to "meet" the environmental challenges. The change of attitude on "green barrier" has made the environmental responsibility of enterprises ready to appear in the scientific field.

In 1992, the CPC central committee and the state council jointly published "China Top Ten Countermeasures on Environment and Development", which are related to corporate environmental issues and responsibility of matters including industrial pollution control, energy utilization and use of economic means to protect the environment. In some of the environmental policies and regulations along with legal amendments promulgated later, it is almost indispensable for enterprises to bear the responsibility for energy conservation, emission reduction and pollution control. Government environmental policies and regulations is a special political discourse, the "discourse" discussed by the top-down intensive political networks to reach every corner of society, showing the attitude of government towards environmental responsibility, and making the concept of corporate environmental responsibility a "propaganda". In the 1990s, government and related departments launched the "close and turn" action against polluting enterprises. Along the Huai industrial enterprises in 1997, the state environmental protection bureau organization discharged the "zero" standard examination. The government departments carried out environmental action with obvious political undertones, being the top down action which was dependent on political networks.

Government departments made "environmental movement" clear for polluting enterprises: if the enterprise cannot meet environmental standards or discharge illegal sewage, it will lose or reduce the survival space.

1.4. Since the 21st century

"The Scientific Outlook on Development and Construction of Socialist Harmonious Society" has raised the notion of environmental protection to the strategic level. There have been a growing number of arguments on environmental protection and sustainable development, which have played a significant role in the demonstration of the idea of corporate environmental responsibility. Some environmental NGOs, environmental conferences, BBS sponsors, and environmental responsibility organizations began to use Internet media to display and publicize the concept of corporate environmental responsibility.

For example, Ma Jun founded pollution map through the Internet to show the concept of corporate environmental issues and responsibility. Through graphical information from pollution enterprises, Internet technology and the released pollution shown to the public, we can promote the concept of corporate environmental issues and responsibility network "work". Every individual, who is concerned about environmental problems, can understand the issues in pollution enterprises, and desire for companies to arouse the idea of mitigation and corporate governance, as long as he or she logs on to the Internet.

In short, from 1970s to now, China's corporate environment responsibility developed steadily.

2. SUCCESSFUL PRACTICE OF CHINA'S CORPORATE ENVIRONMENTAL RESPONSIBILITY

The facts show that Beijing Tong Ren Tang, Jinang Steel and Iron Company and Inner Mongolia Elion Resources Group have had good practice in implementing CER.

2.1. Beijing Tong Ren Tang

Beijing Tong Ren Tang is the famous old traditional Chinese pharmacy, mainly milling pellets and paste Dan. The pharmaceutical product has quality formulations, materials and processing methods. The previous generations of Tong Ren Tang faithfully adhered to the old creed "the labor cannot be reduced in spite of complicated concocting; the material cannot be cut in spite of expensive taste". So the product falls in popular demand all over the world. Among

hundreds of traditional Chinese medicines, tiger bone wine, with precious raw materials, superb production method and significant effect is known as "The Wild Bunch" together with 12 other drugs. The raw and processed materials of tiger bone wine, the supply of tiger, have become a very crucial issue (Tao, 2006).

2.1.1. Problems

In the fifties and sixties of the 20th century, measures were taken to encourage tiger hunt that put the tigers in China in danger of extinction. In 1956, the country alone collected the skin of more than 900 tigers. In the world, it has become increasingly difficult to conserve wild tigers. The world's total number of wild tigers remains only in thousands. Once there is a trade and market demand, tiger extinction would take place in decades. On one hand, there is a national and worldwide surge of rheumatoid patients. Tong Ren Tang is keen to produce drug to treat rheumatism with "caring for their patients" mission. On the other hand, on the basis of national protection of animal, tiger has been banned for hunting and trade. The natural resources obtained from this rare animal's bones for medicinal use seem to lose its future.

In the early 1990s, in order to find an alternative medicine made from tiger bone wine, Tong Ren Tang collaborated with the Chinese Academy of Sciences Northwest Plateau Institute of Biology (CASNPIB). They found Sialon, the animal lives in the alpine grasslands at an altitude of 2800-4300m. Although sialons live all the year in the ground, they never had rheumatism. The local people used sialons' bones to cure rheumatism. Therefore, CASNPIB launched the research on the extract of sialon's whole dried bone, which can treat the endemic rheumatism in Qinghai-Tibet plateau. In 1994, they managed to develop a new generation of drug, "Sialon Rheumatism Wine". The main efficacy substances "Sialon bone" can be regarded as alternatives to tiger. The study of the experts showed that the efficacy ratio of medicine made from sialon bone wine and tiger bone wine was 1:1. The Sialon bone rheumatic wine had the desiccant function, that could even activate blood circulation and nourish liver and kidney.

Sialon is a Tibetan transliteration; its scientific name is plateau zokor. According to grass research experts, there are two kinds of plateau mice; one is the plateau pika living actively on the ground, and the other is the plateau zokor performing activities underground. The plateau zokors live in their underground cave throughout the year. Their caves are 2 to 2.5 meters deep and the moving channel is about 30 cm from the ground. They lead solitary life especially eating the grass roots. According to expert research, the life's essential facilities of plateau zokor include underground bedroom, bathroom, kitchen and barn. The underground activities throughout the year lead to visual degradation of the plateau zokor and

they depend on the auditory and tactile senses. They are accustomed to use the mound to block the entrance (their forepaws are particularly sharp). So the hunters will open the top entrance and set up a bow and arrow there. When they feel that the cave's entrance is opened, plateau zokor runs to block it. Once it touches the bow, it is trapped strive to survive. People remove the skin and meat after they capture the zokors and the bones remain which are called sialon bones.

The mounds, used by the plateau zokor to plug up the hole, covering the grass destroy vegetation. According to statistics, due to the grassland desertification caused by damage to plateau zokor, at present Qinghai province formed 112 million mu of "zokors wasteland". Zokors not only look for fine forage as livestock which reduces the capacity of grassland, but also dig holes to set cave, mine the grass roots, heap the mound and destroy the turf. This results in the disastrous state with miscellaneous and poisonous weeds growing up with the grassland degradation. The serious consequence is "zokors wasteland", also known as the "black beach" with no grass at all. Professionals visiting grassland said, "Zokor's activities on the grass land are a normal phenomenon, but when the zokors exceed a certain number, it causes devastating damage to the pasture and grassland environment."

A zokor eats 204 grams of grassroots a day. In order to reduce the harm by zokor on the grassland, Qinghai province invests more than 8 million yuan every year to buy the zokor control medicine, but the effect is not ideal. The "zokor wasteland" is still increasing year by year. Some experts have estimated that Qinghai zokors annually consume 108.49 kilograms grass. Because of mining pit, they will lose 4.56 kilograms fresh grass. When per kilogram of fresh grass is calculated as 1 dime, the direct economic loss of annual fresh pasture is 1.13 billion yuan. Expert research test proves that plateau zokor has a district feature with special and irreplaceable value. The experts once took the plateau zokor from high altitude grassland and raised them in accordance with the wild underground cave in Xining region, but they died after living less than a month. Even the artificial breeding is successful, its medicinal value is very low. That is to say, the medicinal value of plateau zokor cannot be replaced by other animals.

2.1.2. Practical Effect

From the practice of creating sialon bone wine medicine, Tong Ren Tang shut off commerce through tiger bones and managed to protect the resources of wild tiger. As an alternative to tiger bone wine drug, "Sialon Rheumatoid Wine", used to cure rheumatism, with 1:1 efficacy. At the same time, Tong Ren Tang has also highlighted the economic benefits.

The effective use of sialon as a medicine protected the plateau grassland

resources, provided more grass for cattles' growth and maintained the grassland environmental balance. Through years of study on forest pest control and quarantine stations in Qinghai province, the mound, which is left by plateau zokor on the land, beach, meadow and forest, led to grassland degradation and turf desertification. In addition, plateau zokors have plenty of energy and huge appetite. They eat everything, including potatoes, barley, tree roots, grass roots, wheat and so on. Especially in autumn, each zokor not only reserves 20 kg to 30kg food, but also eats food which is roughly equivalent to its own body weight. Thus the harm caused by plateau zokor is enormous.

However, after the technological research and development of sialon bone medicine, hundreds of people involved in the rank of zokor catching. According to the local catchers, at first they could not meet the demand although they tried their best to trap zokors. In 1995 Beijing Tong Ren Tang Company bought 30 tons of zokor bones, amounting about 130 zokors. In Longhua Hui, an autonomous county, the hunters only took 2 years to finish the 3-year-plan to eradicate zokors for the land and forest recovery. With the relevant departments' agreement, the deratization rate reached 80% to 90%.

It also provides a new way of providing employment for the prairie farmers and enables some farmers to be lifted out of poverty. From the beginning of 1995, Qinghai capture teams expanded quickly, developing from the family unit to 60 to 80 people in cooperation. They gradually extended their footprint from the adjacent villages to the whole Qinghai province. Even the residents of contiguous areas in Gansu and Ningxia provinces also came to Qinghai and joined the ranks of the trap activities. In the peak period, Qinghai province had seven or eight capture teams, comprising more than 400 catchers with thousands of people's assistance in the processing of zokors. Sialon bones were sold to the pharmacy or used in pharmaceutical plant for manufacturing bone medicine. The market price was 180 yuan for every kilogram of sialon bones. Some herdsmen even sold the catching tool. In the regions of Datong, Huangyuan, Huzhu and Meyuan, some farmers earned 800 yuan per person each month in peeling zokor skins.

2.1.3. Case Analysis

For hundreds of years, the raw materials of Tong Ren Tang tiger bone wine had been derived from the endangered tiger bones. Now Sialon bones are used for making wine for rheumatism. In particular, the sialon bone and tiger bone efficacy rate is 1:1. In compliance with the law, Tong Ren Tang actively explored business opportunity and obtained economic benefits. Simultaneously, the use of these bones protects the wild resources and maintains the grassland environmental balance. Therefore, it achieves internal benefit as well as external interests. It is

the genuine implementation of social environmental responsibility that enables the century-old shop to maintain its vitality forever.

2.2. Jinan Steel and Iron Company

Jinan Steel and Iron Company (JSIC) was established in 1958. Its main processes are coking, sintering, ironmaking, steelmaking, rolling mill in pellet, *etc*. Its products mainly consist of the hot rolled sheet, cold-rolled sheet and plate. Currently, it has the staff of 38 thousand workers and 32.2 billion yuan total assets. It ranked the tenth largest national steel and iron company and once won the national quality management award.

2.2.1. Problems

In 1990s, the international and domestic market competition became fierce. The rising prices of upstream raw fuel and falling prices of steel and iron prices reduced corporate profits markedly. At the same time, resource and environmental problems attracted great worldwide concern. The traditional mode of economic growth at the expense of the environment came to a closure. The production of steel and iron enterprises was the process of energy consumption by coking, sintering, iron making and steel rolling. Every process started from heating to cooling and reheating and recooling. Heating consumed energy and cooling emitted heat with various cooling equipments, cooling water and electricity and other resources. Energy and material consumption increased to more than 70% of the total cost of steel and iron products. Compared with the world's advanced steel and iron enterprises, in 1995 the production of energy per ton steel by Japanese enterprise only expended to 656 kilograms of standard coal, while JSIC expanded to 919 kilograms of standard coal. Therefore, the main space of JSIC to reduce the cost was energy saving and consumption lessening (Xu, 2006).

2.2.2. Strategy Formulation

Through constant exploration, JSIC's work of comprehensive utilization of resources has experienced the cost-focused stage of energy saving, consumption reduction and potential gain tapping with environment-focused stage of cleaning and energy-resource-focused stage of circular economy development. It has formed circular economy mode "high efficient utilization of resources, high efficient energy transformation, distributed management implementation and waste resources achievement".

Over the past ten years, JSIC has undergone three stages of development strategy: The first stage is the "Ninth-Five-Plan-Period" implementation of energy saving methods, through technological transformation strategy of "content mining". The

second stage is "Ninth-Five-Plan-End-Period" strategy for "fine, strong and beautiful" quality; and the third stage is adjusting the previously formed strategy of "spanning development for strong competition" in 2002. Each strategy stage firmly focused on the theme of comprehensive utilization of resources.

In the grim situation of upstream rising raw fuel prices and decreasing steel and iron product prices around 1995, JSIC established the low cost strategy of "energy saving and content mining" to address the reality that iron cost accounting for 70% of the total cost of production. Therefore, in 1997 when Asian financial crisis led to enormous consequences and the industry wide benefits declined significantly, the JSIC's benefit did not drop, but increased steadily.

JSIC brilliantly expounds that the overall development strategy is to achieve the "fine, strong and beautiful" plan. "Fine" plan means casting fine material, using fine labor, generating fine product with the main board brand with a focus on the characteristics of "high strong, enduring and corrosion resisting". "Strong" plan means the core competitive products with high quality, more variety, low cost, high-tech and high added value. "Beautiful" plan means the beautiful environment. The pollutants are regarded as the misplaced resources and subject to the resource management. With the improvement of afforestation and beautification level, the JSIC will be built into a clean energy conservation factory.

In 2002, the 16th Party Congress set out comprehensive construction of a well-off society strategic plan, and put forward the new road to industrialization, which had high scientific and technological content, good economic benefit, low resource consumption, little environmental pollution, and human resources of more contribution. Facing with the new opportunities, JSIC used structural adjustment as the main line, changed the mode of growth, and formulated the overall strategy of "doing bigger and stronger to achieve the span development". The main goal of JSIC was to achieve zero emissions of industrial wastewater, reach the national second level of plant air quality, meet the first standard of steel rolling area and minimize enterprise pollution. At the same time, it would make full advantage of steel and iron smelting process, to actively absorb the city life and industrial waste, turn the plant into a city "cleaner" asset and clean the raw materials' supply base of related industry, thereby leading to an indispensable friendly partnership of the community as well as the industrial value chain to build good pattern of orderly logistics.

2.2.3. Measures

Based on the principle of source reduction, JSIC attaches great importance to iron for making raw material structure design and develops a scientific design

program. In light of the division of functions, technical center is in charge of iron making raw material structure design. According to the yield and material resources, it first ascertains the raw material structure. Based on the above framework, it determines the proportioning of raw materials in terms of the lowest cost, the best function with the comprehensive metallurgical properties and production organization antegrade principle. It adopts the laboratory test to define the initial optimization of raw material blending structure and carries out industrial test to validate the raw material ratio of structure.

Backward production technology and process structure are the key to high consumption of energy and materials. Therefore, JSIC carried out energy-saving technological transformation, for example, full steel continuous casting, rolling a full once-heating production, *etc*. In 1996, it eliminated the casting and rolling mill, shortened rolling cogging process and improved the production organization of the intensive degree. It matched the process capability through the overall balance, the potential power of system. In the new project, JSIC focused on the compact and short process of energy saving. In the national key project of pipeline steel, it created 120 tons of converters to thick plate production line of hot delivery and direct rolling technology for high temperature billet, directly to the medium and heavy plate production line with no cooling. Thus it greatly improved the heat efficiency and reduced the process of energy consumption significantly.

JSIC adhered to independent innovation and strengthened the efforts for the development of independent intellectual property rights of technology. It invested 700 million yuan to support research and development, independently developed more than 90 cleaning technology items, and achieved 62 patents, including 20 national invention patents, 68 prizes for scientific and technological progress at the provincial and ministerial level. “The Research and Application of Dry Coke Quenching Technology” won the second prize in national scientific and technological progress. “The Research and Application of Coking Plant Clean Production Technology”, and “Steel Heat Resource Efficient Cascade Comprehensive Utilization Technology Development” received the “Provincial Science and Technology Progress” award, “China Metallurgical Science and Technology Progress” award and the second prize of “National Science and Technology Progress”. In 1999, JSIC built the first domestic system of coke dry quenching facilities with independent intellectual property rights, and it created 5 patents. The project was devised by JSIC Design Institute and mainly equipped JSIC manufacturing facilities with more than 95% of localization rate. It could achieve the benefit of 55 million yuan every year through the improved quality production of steam, power and coke. It also greatly enhanced the operating environment and field environment.

Since 2003, JSIC has concentrated on the whole process of energy system optimization. It optimized the structure of energy source and energy usage model, implemented the in-depth upgrading of energy saving and proposed the innovative idea "gas-steam combination cycle power generation" as the core of efficient utilization of heat energy resources *i.e*. full hot delivery and hot charging billet, complete storage of heating furnace of steel rolling heating plate, complete double length rolling and gas structure, gas calorific value adjustment and blank structure adjustment. Through the gas-steam combined cycle power generation project,JSIC began to carry out gas and electric transformation to realize the clean and efficient energy conversion. Through the application of new ideas, for meeting gas production, JSIC successfully implemented the "the gas-steam combining cycle power generation" by using mixed gas with low heat value in 2004. This project was the first generation of low calorific energy mixed with gas and steam in cycle power generation in the world. The stable operation of the production unit used efficient gas power generation technology and generated double power. The first creation was to mix gas compression and expansion to drive the first generation. The second creation was by gas turbine expansion that generated high temperature and drove the second generation through the heat exchange. It was 50% more efficient, compared with the conventional boiler type generating unit. Also it realized the efficient transformation and utilization of metallurgical structure without any residue, waste and pollution. Therefore, it offered comprehensive economic benefit, social benefit and environmental benefit.

At the beginning of 1997, JSIC Jinan implemented "Four Closed Circuits": closed circuit of steel slag and dust containing iron utilization, closed circuit of gas utilization, closed circuit of industrial water utilization, and closed circuit of waste heat steam CCTV utilization. It set up an industrial chain and carried out governance of various technological wastes. Through the "four closed circuits", JSIC met the four targets: waste resources, steel rolling heating furnace and sintering ignition without oil, coal boiler and heating refrigeration through residual heat.

JSIC, the so called "distributed management" aimed to focus on efficient use of resources and energy, to bring an efficient change. The slag, dust, water, and gas generated in iron and steel production processes are broken up through local transformation, by the local governance for local use. In contrast with the traditional governance model, it saves investment, has a quick effect, and runs at a low operating cost and achieves high effectiveness as well (See Fig. **1**).

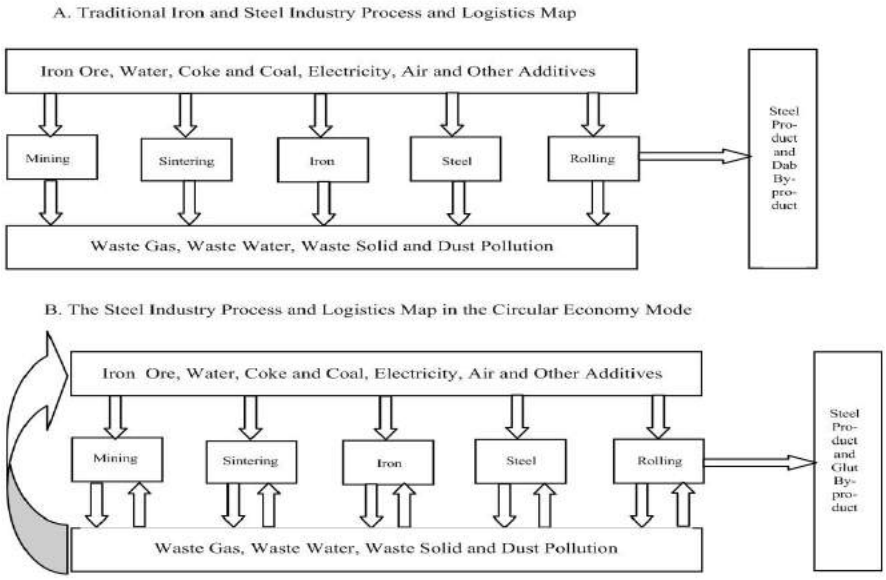

Fig. (1). Traditional and Modern Economic Development Comparison (Source: Xu, 2006).

2.2.4. The Main Effect

In recent years, JSIC incessantly carried out clean production, explored the recycling economy development, and achieved the harmonious development of cost, quality, resources, environment and benefits. It gained the development space, reduced the environmental load, facilitated industrial and technological progress and promoted the core competitiveness.

It reduced the energy and materials' consumption. There are currently 17 major manufacturing processes followed by the whole company; 11 being the special processes, 3 as the first class processes, and 3 as the second and the third class processes; while the below processes have been eliminated. Compared with the performance in 1995, fresh water consumption per ton steel decreased 82% in 2005, 177 million cubic water meters were saved and the saving benefits were 440 million yuan; comprehensive energy consumption per ton decreased 44%, and the cumulative saving was 18 million tons of standard coal, which was worth $12 billion.

It reduced cost and promoted the benefit of steadfast and constant growth. JSIC's steel and iron production cost belongs to the advanced level of the national industry, with the leading product of board cost maintaining continuous lead . It keeps a low cost advantage in the fierce market competition. In 2005, JSIC's pre-

tax profits and general profits were 9.5 times and 10.2 times, respectively, which were higher than in 1995. Even in 1997, when there was a tremendous impact caused by the Asian financial crisis of the whole industry, it pursued effective growth.

It reduces pollution and develops environmental protection. Compared with the conduct in 1995, every square kilometer industrial dust emissions decreased by 53% in 2005 and the environmental quality improved significantly. In addition, JSIC built the clean and civilized factory and established environmental friendly enterprise at the provincial level.

It boots the product competitiveness. It adheres to the development of clean technology, the manufacture of clean products, the promotion of product life cycle and the contribution to the users and community with recycling high-end products. It has developed high intensity, clean and new products such as X60, X52, JG590 pipeline steel high strength steel and bainitic steel, *etc*. The varieties of steel plate are of high technology content . It brought the change from orientation to carbon steel to varieties of steel thus, leading to a competitive advantage.

2.2.5. Case Analysis

In the production process, the steel and iron enterprise expands a great deal of energy and resources and the waste emissions are also massive. So it will cause severe damage to the environment. From the iron ore mining to finished products, almost every link causes different degrees of pollution in the environment, and consumes considerable resources. Iron ore mining leads to the vegetation damage in hilly areas and the pollution of rivers; coking process produces a large amount of sulfur dioxide and carbon dioxide, which leads to acid rain and the greenhouse effect; blast furnace smelting iron and steel process produce gas, dust and metal dust. At present, many iron and steel enterprises management also have the improper orientation, which is one-sided pursuit of production quantity, regardless of resources' exploitation and environmental damage. The introduction of the development of circular economy mode highlights the efficient use of resources and environmental protection through the transformation of traditional process as well as the innovation of technology and management. It minimizes the pollution emissions, makes the waste harmless and reusable, and obtains high economic benefit and environmental benefit at a lower cost. Accordingly, it improves competitiveness of the enterprise in international market. This proves to be the beneficial reference for Chinese steel and iron enterprises to change the mode of economic growth.

2.3. Inner Mongolia Elion Resources Group

Inner Mongolia Elion Resources Group (IMERG) is one of the 20 key enterprises in the Inner Mongolia Autonomous Region. IMERG was set up in 1995. After 10 years of development, it constructed the development strategy, according to which, the energy and chemical industry was regarded as the leading industry, liquorice industry as an advantageous industry and the real estate business as the core industry. Its business scope is related to the fine chemical industry, energy chemical industry, pharmaceutical industry, tourism, and real estate development, *etc*.

2.3.1. Problems

IMERG is formerly known as an Inner Mongolia Line Banners Salt which is found in the Kubuqi desert Sahara Lake, known as Salt Lake. Salt Lake is rich in chemicals. In order to keep the Salt Lake from the sand attacks from Kubuqi, IMERG president Wang Wenbiao led his team for planting grass and trees around the lake with a purpose of indomitable fighting with the wind and sand. In the long struggle with wind and sand, IMERG people found the wild licorice in the desert and realized its great value. At the same time, the desert is a clean land which is hard to find. It is very conducive to the cultivation of licorice. How to form the licorice industry chain and value chain for governing the desert is a difficult problem for IMERG.

2.3.2. Solution

The solution proposed was to exploit the desert resources and adjust industrial structure. From the successful implant of grass net in the "road through desert grass" protection, IMERG observed that the Kubuqi desert could be managed and there were irreplaceable resources in the desert. Kubuqi desert abounds in wild licorice, which is popular in domestic and foreign markets and known as "the beam outside licorice" and "northwest channel licorice". According to the international market rules, if traditional Chinese medicine enterprise intends to enter the international mainstream market, it must solve the problem of quality resources and meet the standard GAP. The first question of GAP standard is no pollution and no residue, especially that the heavy metals cannot exceed the standard. The desert is a natural development base to meet the needs. In 1998, IMERG decided to execute the development strategy of "locking around, penetrating abdominal, developing desert and building licorice Silicon Valley". The strategy relied on the quality Glycyrrhiza uralensis in the desert and other sand xeric Mongolian medicinal resources. It has undergone several major changes and the transformation of industry, turning the chemical industry into licorice as the main line and positioning the green in Mongolian medicine

pharmaceutical industry as the basic industry.

Measures were also taken to integrate the desert resource at a large scale and turn the advantages gained from desert into competitive industrial advantages. For enterprises with licorice and other Chinese herbal medicines, desert industrialization must have clear land ownership and property right. Thus it can operate according to the mode of "unified planning, unified management, unified execution and partition management", and also can form the large scale advantage. By the support of local government and through the state-owned transfer, farming land receives adequate shares and one-time compensation. IMERG integrates 2.2 million mu sand in the north desert, the south bank of Yellow River 204 kilometers long and the narrow strip and the desert hinterland, both sides of sand through road and the junction of Meng Ning areas. It provides a carrier for sand prevention, sand control and sand utilization at a large scale. On this basis, through the enclosure to prevent grazing, surrounding sowing and nature restoration means, IMERG implemented the forest, grass, and herbs construction project in the delimit area comprehensively and received benefits. It converts the desert into fertile land and an oasis, and turned the "sand harm" into "sand benefit". In order to turn the licorice resources into tangible economic benefits, IMERG focused on sand industry engineering with liquorice as the main line, standing on the environmental basis. Through the enclosure sowing, 2.2 million mu traditional Chinese medicine set up, making licorice and bitter beans the main line. Thus the Chinese herbal medicine resources meet the industry standards. Meanwhile, IMERG used the national ownership of the franchise and processed the "Yili" brand of licorice grass and licorice pieces and other primary products. Using its waste, IMERG made the high-tech in-depth development to elongate the series of product chain using licorice as raw materials. In addition, as the representative of a group of new healthy products and herbal varieties, the introduction of "good licorice throat" boosts the healthy development of sand industry. Through years of enclosure planting in desert, a capacity for 500 thousand heads of cattle breeding livestock grass has been developed.

Green industry environment pattern must be established to improve desert governance mechanisms. According to the "local condition and partition management" principle, IMERG implemented intensive and large scale planting of the forest, grass and herbs. It built the complex pattern of industry environment, which is "forest with drugs, drugs in forest, the integration of forest, grass, herbs, tourism and cultivation". IMERG vigorously promotes the five environmental projects: The first is to implement a million acres of licorice plant engineering. In recent years, they have completed 220 acres of licorice plant engineering with some grass in between. The grass-herb-integration production pattern was formed in the long northern edge of the Kubuqi desert strip of 204

kilometers and Maowusu desert. The second is the implementation of one hundred mu of Salix Caragana project. They planted more than 1 million mu Shaliuhe Caragana and 1.2 million mu grass seeding along both the sides of cross sand rode and the northern edge of desert. The third is to implement 100 thousand mu of fast growing timber engineering. In the northern margin of Kubuqi desert and the south bank of Yellow River water rich region, according to the geographical conditions of forest, grass and herbs features, they planted more than 100 thousand polars with licorice and grass in between. The fourth is the implementation of 100 thousand mu artichoke industrial engineering. Currently, they have completed 30 thousand mu artichoke bases in the Kubuqi desert. The fifth is the construction of one hundred kilometers tourism landscape. They cultivate forests, grass and endangered medicinal plant around 7 freshwater lakes within 300 square kilometers in Kubuqi desert. The environmental landscape of "desert god lake" forms the "desert superb view" of desert oasis, flowers and herbs, blue sky and green water, attracting visitors from all directions. Meanwhile, it changes the local farmers' traditional way of life dominated by livestock.

In constructing the environmental industrial parks, IMERG follows the approach of "government guidance, enterprise demonstration, market promotion and agriculture and business combination", and the development mode of "company + base, base + farmer". According to forest, grass, drugs, meat, sheep and environmental tourism combination principle, IMERG further increases the environment protection to reach the greener desert, increase income of the farmers, with more government tax and more efficient business. It also opened a new way to solve the rural problems for the farmers and herdsmen in the sand area.

2.3.3. Main Effects

Through desert governance and environmental construction, IMERG made four achievements in building the Kubuqi desert.

The first is the significant environmental benefit. Currently, the total desert managed by IMERG is more than 3 million acres and the controllable area is 2/3 of the Kubuqi desert. In other words, one company has dominated more than a half desert. IMERG not only curbs desertification, but also protects the Yellow River and improves the local people's living environment.

The second is the significant social benefit. The local farmers and herdsmen use sand land to join shares and turn "sand harm" into "sand benefit". They are both corporate investors and environment construction workers. Not only do they have the benefit on equity, but they also have labor income.

The third one is the economic prominence. The region within the management of IMERG has the basic conditions of capitalization. It has laid a foundation for the next diversification of investment and development. Meanwhile, the enterprise receives a direct benefit. In 2004, the direct income from the licorice-based sand industry exceeded from 300 million yuan to 400 million yuan this year. The driven sale of pharmaceutical products is around 15 billion yuan. By 2008, its economic benefits became double.

The fourth is the higher benefit of demonstration. Through the successful practice of IMERG sand prevention, sand governance and sand utilization, it drives and demonstrates the large scale cultivation of desert forestry, grass and herbs. By the local government promotion in recent years, the surrounding farmers and herdsmen implemented the large area base construction of forest, grass and herbs. They also received good economic and environmental benefits (Wei and Tang, 2006).

2.3.4. Case Analysis

Desertification is a worldwide problem. Through green industry development, IMERG turned the desert into fertile farmland and oasis, and "sand harm" into "sand benefit". It also increased the income of thousands of farmers. Thus it not only dealt with this problem, but also produced good economic, environmental and social benefits. IMERG's achievements prove that investment is needed for the fulfillment of CER. If the fundamental interests of the society (desert governance and environmental protection) are regarded as the prerequisite for the enterprise development, the progress of enterprise will be in the right direction and investment for this purpose will also get double rewards.

3. CULTURAL ROOT OF HEAVEN-MAN COORDINATION

Corporate environmental responsibility is effective to handle the relationship between man and nature, which is also an important proposition of human to settle down. Since ancient times, there has been a fine tradition to study man and nature in China. Different from the modern Western philosophy, which says that man and nature are opposite to each other (Susan, 1993), most thinkers in ancient China had a holistic attitude toward man and nature issue. They regarded man and nature as an integrity unity. In the initial classical Chinese books of "Yi Jing" and "Hong Fan", the Gossip Theory selected eight things in the nature to explain the root of all the other things in the world; they are the heaven, earth, thunder, fire, wind, pool, water and mountain with heaven and earth being the main source. They are the parents who gave birth to the other six children, that is the thunder, fire, wind, pool and mountain. The "Five Elements Theory" regards the five basic materials metal, wood, water, fire and earth as the essential elements of all things

in the world. This systematic view of "coherent man and nature, supporting each other mutually" has a long history. It is an inspiration for today's green business.

The fundamental characteristics of Chinese culture is the pursuit of universal harmony of one's own mind and psychology, individuals and others, man and nature, as well as man and cosmos. Universal harmony in Chinese philosophy includes the common values of "Zhou Yi" (Book of Changes) philosophy, Confucianism and Taoism. As far as the Confucian is concerned, the pursuit of universal harmony has been the basic spirit since Confucius. He clearly stated the idea of 'harmony with difference' which had a profound impact on the entire Chinese philosophy at a later time. According to the book "Moderate", "harmony", on the world fundamental basis, refers to the broad road up to the world; it can make all the things to the security of their utopia (The highlighted sentence is vague and must be re-phrased). In the book "Moderate Chapters Annotations", Zhu Xi thought that an individual's practice would lead to morality and final harmony and the ultimate achievement is the utopia of 'proper position of heaven and earth' and 'prosperous development of all things'. As the most precious being with initiative between heaven and earth, human has the important mission to eliminate the discordant state and promote harmonious state, in order to fully realize the heaven's 'benevolence'.

The ancient Chinese notion of man-heaven-coordination is the essence of classical Chinese culture. It highlights the unity of man and nature. In other words, human being should not only transform the nature but also comply with it. Meanwhile, man can not succumb to nature, or destroy it. Human beings are neither the master of nature, nor the slave of nature, but are friends of nature, who take part in various activities to bring up all things. In contrast with the painful feeling of the inherent inadequacy of traditional analytical methods, western scientists and philosophers got inspired from the Chinese holistic way of thinking and adopted the holistic and friendly way to re-examine the objective world (Roderick, 1989). As a British scholar Joseph Needham put it, when Greeks and Indians developed mechanical atomism, Chinese people developed the organic philosophy of the universe. In this regard, the west is elementary and China is profound. When Chinese companies communicate with international companies, they need to participate in the international exchange more actively, increasing the initiative and the right to speak. As a flash of Chinese elements, the ecological wisdom of "heaven-human-coordination" should shine at international stage.

4. SUMMARY

Recently, China has made some achievements in water environment, atmospheric environment, solid waste, environmental pollution and environmental pollution

governance investment. The intensity of environmental governance is gradually strengthening. Beijing Tong Ren Tang brought Sialon in the field medicine. It effectively protects the plateau grassland resource and maintains the grassland environmental balance. Jinan Steel and Iron Company introduced the development model of circular economy, to minimize pollution in the process of production and consumption, and put waste resources in harmless disposal. This resulted in larger ecological benefits at a lower cost. Through the development of green business, Inner Mongolia Elion Resources Group turned desert into fertile land and oasis, and turned "sand harm" into "sand benefit". It made ten thousands of peasants rich. Ancient Chinese heaven-human-coordination idea is the core of Chinese culture. It provides deep inspiration for the development of today's "environmentally friendly" enterprises. SDS lies in the environmental performance review, assessment of typical cases and tracing timeless wisdom of ancient Chinese ecology. In this process, the system view, process view and time and space view tell us that the sustainable development of Chinese enterprises is deep rooted. With in-depth understanding and strengthening practice, China's CER will reach a higher level.

DISCLOSURE

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REFERENCES

Armstrong, S.J., Botzier, R.G. (1993). *Environmental Ethics: Divergence and Convergence* (p. 382). New York: McGraw-Hill.

Bei, T. (2006). *Beijing Tong Ren Tang: Sialon Replacing Tiger Bone, Protecting the Environment and Curing Rheumatism. Responsibility Competitiveness.* Beijing: Business Management Press.

China's National Bureau of Statistics Website. www.stats.gov.cn

Feng, Z. (2004). *Introduction of Circular Economy* (pp. 18-20). Beijing: Renming Press.

Jie, W. (2003). *Systematic and Dialectical Science* (pp. 38-39). Beijing: Renming Press.

Peng, H. (2012). *Corporate Social Responsibility Basic Textbook* (pp. 137-138). Beijing: Economic and Management Press.

Qiang, W., Kang, T. (2006). *Elion Resources Group Company: Development of New Industry into the Desert. Responsibility Competitiveness.* Beijing: Business Management Press.

Xu, D., Li, G. (2006). Steel and Iron Business Case in the Circular Economy Development Mode—Jinan Steel and Iron Company, China's Second Session of the Conference Proceedings on Management Cases.

CHAPTER 7

Origin of Problem: China's Corporate Environmental Pollution and Responsibility Analysis

Abstract: In recent China, the corporate environmental pollution is an indisputable fact nowadays. The environmental pollution has a variety of forms, such as water pollution, air pollution, solid waste and so on. And the problem of pollution is originated from the overall responsibility, including the government, corporate and the public. The situation that is grossly inadequate of total resources and per capita resources, resource consumption growing at an alarming rate, extensive growth phase of resource use efficiency, high dependence on external resources, lower utilization of renewable resources shows that China's resource is difficult to support the continued growth of traditional industrial civilization. Environmental pollution is firstly and essentially corporate social responsibility issue. Investigation shows that the enterprise managers have deviation understanding of CSR, the local enterprises do not have mature CSR strategy and management system, and SMEs are lack of attention of environmental protection; Secondly, the government has the responsibility vacuum in guiding enterprises to take social responsibility. In the wrong guidance of pure pursuit of economy interest by some local governments, the local protectionism becomes the umbrella and shield of environmental violations. Lack of law regulation and government failure to take environmental responsibility create convenience for the low rate of energy utilization, poor electronic waste management; Thirdly, the public participation in China is insufficient. City residents' energy conservation behavior is generally insufficient and rural residents' awareness of environmental problems severity is lower. Until recently the public has become an important pressure to promote CER. Therefore, the responsibility awareness is urgently needed.

Keywords: Corporate environmental responsibility (CER), Corporate social responsibility (CSR), Enterprises, Environmental pollution, Government, The public.

Since 1978, China has experienced a long-term, rapid and economic growth. When most residents living quality is improved significantly, the economic development has caused serious environmental problems. In recent years, the increasing corporate environmental pollution is an indisputable fact. The environmental pollution has a variety of forms, such as water pollution, air

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pollution, solid waste and so on. From the perspective of SDS, the problem of pollution is from the overall responsibility, including the government, corporate and the public.

1. CHINA'S RESOURCE SITUATION

From the aspects of resource possession, resource consumption, resource use efficiency and resource external dependence, China's resource situation is worrisome. It is difficult to support the current high pollution, high consumption and low efficiency of production pattern, which continued to expand.

1.1. Grossly Inadequate of Total Resources and Per Capita Resources

From the perspective of resource possession, China's total resources and per capita resources is grossly inadequate. In terms of total resources, China's oil reserves only account for 1.8% of the world, natural gas 0.7%, iron ore less than 9%, copper less than 5%, bauxite less than 2%. In terms of per capita resources, China's per capita mineral resources is ½ of the world average, per capita arable land and grassland resources is 1/3 of the world average, per capita water resource is ¼ of the world average, per capita forest resources is 1/5 of the world average, per capita energy is 1/7 of the world average, in which the per capita oil possession is 1/10 of the world average.

1.2. Resource Consumption Growing at an Alarming Rate

From the perspective of resource consumption, China's consumption grows at an alarming rate. From 1990 to 2001, China's oil consumption increased 100%, natural gas increased 92%, steel increased 143%, copper increased 189%, aluminum increased 189%, zinc increased 311%, 10 kinds of nonferrous metals went up 276%. Today, China's steel consumption has reached about 2.5 million tons, close to the total steel consumption of United States, Japan and EU, about 40% world consumption. Cement consumption of about 800 million tons, accounting for 50% of the world; Power consumption has surpassed Japan, ranking second in the world, just below the United States. China's existing reserves of oil and gas resources will be less than 10 years of consumption. The ultimate recoverable reserves can be maintained for 30 years. In terms of iron, copper, aluminum and other important mineral reserves, either relative or absolute, China has no longer great power status. From 2012 to 2014, China will encounter 240 million to 260 million tons of iron consumption peak, the next 20 years will have the gap of 3 billion tons. From 2019 to 2023, China will encounter the 5.3 million to 6.8 million tons of copper consumption peak, the next 20 years will have the gap of 5 thousand to 6 thousand tons. From 2022 to 2028, China will encounter the 13 million tons of aluminum consumption peak, the next 20 years

will have the gap of 100 million tons. China's original reserves, production and export volume of tungsten, tin and other rare earth minerals used to be ranked the first in the world. Because the indiscriminate digging and excessive exports, absolute reserves have dropped 1/3 to 1/2. According to the existing production level, the protection degree will be no more than 10 years (Feng, 2004).

1.3. Extensive Growth Phase of Resource Use Efficiency

From the view of resource use efficiency, we are still in the extensive growth phase. For example, in terms of energy use efficiency characterized by per unit of GDP consumption output, there is a very large gap between China and developed countries. If Japan is 1, Italy will be 1.33, France 1.5, Germany 1.5, UK 2.17, U.S. 2.67, Canada 3.5, while China is as high as 11.5. In terms of output efficiency per ton of standard coal, China is equivalent to 28.6% of U.S., 16.8% of EU and 10.3% of Japan. Inefficient use of water resources in China is common. The average utilization coefficient of agricultural irrigation is 0.45, while the developed countries reached 0.7-0.8. And the industrial water consumption per unit output value is 5-10 times of the OECD countries (China Engineering Institute, 2000).

1.4. High Dependence on External Resources

From the view of dependence on external resources, in the future period, China's industrial structure is still in the heavy chemical industry dominant stage. The high energy consumption and high pollution industry will still exist. In 2006, the deputy director of National Bureau of Economic Operations Development and Reform Commission Jia Yinsong pointed out that the domestic steel industry dependence on foreign iron ore was increasing, and was over 50%. At present, China has become the world's largest iron ore importer. Because of the shortage of domestic resources, by 2010, China's oil import dependency will reach 57%, iron ore 57%, copper 70% and aluminum 80%. By 2020, China's oil imports will exceed 500 million tons, natural gas will exceed 100 billion cubic meters, both external dependence will respectively reach 70% and 50%.

1.5. Lower Utilization of Renewable Resources

From the recycling point of view, China's resource recycling rate is far lower than developed countries. For example, although China's per capita water resources is only one-fourth of the world average, the water recycling rate is lower than that in developed countries. In terms of industrial water, China's recycling rate is 30%-40%, while the utilization rate of OECD countries is 75%-85%. The renewable resources utilization is generally low. China is about to enter the automobile society, a large number of waste tires pollution is on the rise. However, China's

scrap tire recycling rate is only about 10%, far lower than developed countries (Feng, 2004).

In short, China's domestic resource is difficult to support the continued growth of traditional industrial civilization.

2. CHINA'S CORPORATE ENVIRONMENTAL POLLUTION

Although some enterprises have achieved good environmental performance, the adverse consequences of waste water, waste gas, waste emissions growth and low efficiency of resource use took place, because of the most enterprises' environmental mismanagement. In some areas, the environment is continuing to deteriorate and has become a serious constraint to economic growth.

2.1. Water Pollution

With China's economy growth, demand for water resource continues to increase. From 1980 to 1993, the city water increased by 350%, the industrial water increased by 2 times (World Bank, 2001). In several parts of China, the water shortages, water pollution and groundwater plane decrease and drought disaster increased the shortage of water resources and the cost of purifying water. If there is no complete infrastructure, it may threaten the safety of drinking water and result in threats to the residents' health. This also has serious implications for the safety of industrial and agricultural production and cause the loss of fisheries. It is estimated that due to water pollution China's annual economic losses amounted to 1.5% to 3% of GDP. The significant impact is more than flooding and drought impact (World Bank, 2001). Water pollution is mainly caused by industrial wastewater emission and untreated city sewage discharge.

Because of the serious pollution of surface and groundwater and the lack of water supply facilities, especially in rural areas, China's drinking water quality degraded. Although urban water supply coverage in 1998 reached 96.8%, 3/4 drinking water does not meet the standard. In rural areas, in the late 1990s, the population of drinking water only occupied 23.3% of the total population, of which half of drinking water did not meet the national drinking water standards. The quality of drinking water in China is only 35 indicators, far below the WHO (49), Japan (59), EU (66) and the United States (83) standards. In addition, several indicators of lower limit is comparatively low, for example, the turbidity standards in China is five times lower than the OECD countries, the standard value is even lower in rural areas.

In recent years, China's water pollution incident has shocked the world. In November 13, 2005, Jilin Petrochemical Company pairs of benzene plant

nitrobenzene distillation column exploded and caused the water pollution in the Songhuajiang River. The significant chemical pollution caused coastal residents without water for several days. This is the biggest environmental pollution accident since the state founding. When Taihu Lake cyanobacteria incident was not over, in 2007 June, Chaohu lake pollution came into being. Wuxi citizen scare buying drinking water situation again cause people's reflection. There are more than 300 heavily polluting enterprises surrounding Taihu, pouring a lot of sewage everyday to Taihu. And the former beautiful Taihu became "the garbage of pollutants distribution". Table **7.1** is China's seawater quality evaluation in 2003-2006.

Table 7.1. China's Seawater Quality Evaluation in 2003-2006 (number unit: million square kilometers).

Year and Pollution State	Cleaner Sea Fields	Slightly Polluted Sea Fields	Medially Polluted Sea Fields	Seriously Polluted Sea Fields	Primary Contaminants Beyond Standard
2003	8.05	2.20	1.49	2.40	Inorganic salt, phosphate, lead
2006	5.10	5.21	1.74	2.84	Inorganic salt, phosphate, lead

(Source of material: Chinese Statistics Bureau Website).

Due to pollutant effects the inorganic salt, phosphate and lead beyond the primary standard, compared with 2003, in 2006 our country relatively clean sea area was reduced by 29,500 square kilometers, mild polluted sea area increased by 30,100 square kilometers, moderately polluted sea area increased by 2,500 square kilometers, and the serious pollution of the waters of the area increased by 4,400 square km. If the enterprises do not try to take seriously and take necessary measures promptly, the consequence of sea water deterioration will enable us to pay a huge price.

2.2. Air Pollution

Air pollution affects human health and the environment. It will continue to be China's major environmental problems in the future. The main air pollutants are Suspended Particles (TSP) and Sulfur Dioxide (SO_2). The environmental concentrations of TSP and SO_2 in China's cities rank the world's highest level. In 1998, seven Chinese cities appeared in the world's ten most air-polluted cities. In the 88 cities monitored by SO_2, more than half of them surpass the WHO indicators. In the 87 cities monitored by TSP, apart from 2 cities, the others are far beyond the WHO target (National Environmental Quality Report, 1996).

Recently, there is a rapid increase in the city motor vehicles. It led to the rising content of carbon monoxide (CO) and Nitrogen Oxide (NOx). The urban air is deteriorated and severe photochemical smog is caused. In major cities whose

population is over 1 million (such as Guangzhou, Beijing, Shanghai, Anshan, Wuhan, Zhengzhou, Shenyang, Lanzhou, Dalian and Hangzhou), the Nox is increasing and surpass the 2 class standard (2 class is the national air quality standards of residential and commercial areas). From 1991 to 1998, in the report monitoring data of 60 cities, the total population at Nox beyond 2 class amounted to 60%. Almost all of the pollutants increasing phenomenon occurred in the 32 largest cities. The environmental control of other pollutants, such as CO, O_3 and Pb, has not been planned.

According to the dose response function by World Bank, each year 346,000 patients are hospitalized with urban air pollution exceeding the standard. The main consequences of air pollution include respiratory infections, asthma and chronic bronchitis. Several studies have recorded the serious health consequences due to indoor air pollution by coal combustion in China (Zhu, 1995).

2.3. Industrial Solid Waste Pollution

Industrial waste, especially hazardous waste, contaminates soil and groundwater and affects the environment and human health through the leaching toxic substances such as heavy metals, nitrogen compounds, chlorine compounds and other organic matter. In China, most of industrial solid wastes are smelting waste, coal ash, slag, coal gangue, chemical residues, residues and radioactive waste. In 1999, 780 million tons of industrial solid waste was produced, in which 10.2 million tons of hazardous waste was ultimately disposed. The utilization of industrial solid waste and safe disposal rate were 45.6% and 13.7%. Discharge of industrial waste will undoubtedly lead to huge environmental and health problems. Toxic and harmful heavy metals, phenol, and radioactive substances can have an immediate or potential impact on human health through skin contact, contaminated food and breathing. Indirect effects include the environmental pollution such as reduced surface water and groundwater quality (Hu, 2004).

Table 7.2. Recent Warning Indicators of Industrial Waste Discharge.

Indicators	2001	2002	2003	2004	2005
Industrial Wastewater Emissions	203	207	212	221	243
Industrial Sulfur Dioxide Emission	1947	1927	2159	2255	2549
Industrial Soot Emission	852	804	846	887	949
Industrial Solid Waste Generation	88840	94509	100428	120030	134449
Industrial Hazardous Waste Generation	952	1001	1170	995	1162

Source: China Statistical Yearbook.

As is shown in Table **7.2**, from 2001 to 2005, there was an increasing trend of

China's industrial wastewater emissions, sulfur dioxide emissions, industrial soot emissions, industrial solid waste generation and industrial hazardous waste generation. If the environmental pollution is not effectively controlled, people's health will be threatened and economic development can not be sustained.

2.4. Low Utilization Rate of Energy Development

The waste of energy development and utilization results in the resource consumption over environment carrying capacity and environmental pollution. According to the environment capacity analysis, China's annual emission of sulphur dioxide is allowed for 12 million tons. But in fact, in 2000 China's sulphur dioxide emission reached 2,000 tons in 2000 and 22.54 million tons in 2004. Currently, the country has formed six acid rain areas and nearly two-thirds of the city's air quality does not meet the second class criteria. China has huge energy consumption and the consumption structure is also very unreasonable. The small proportion of low-quality energy results in low utilization rate. Most of the rich coal reserve combusts directly with low utilization rate.

Bao Yunqiao, vice chairman and researcher of China Energy Research Society, said that China's energy consumption intensity is much higher than the developed countries and the world average, about three times of the United States and seven times of Japan. China is one of the countries to have highest unit energy consumption. The GDP created by per kg of standard coal is only 0.36 $, while Japan created 5.58 $, about 15 times of China, and the world average is 1.86$. China's energy efficiency of industrial boilers is 60%, 20% points lower than the developed countries; average unit energy consumption of major products is 40% higher than the international level; the unit floor area of heating energy consumption is equivalent to 3 times of similar climatic conditions in developed countries; each industrial sector consumes more than 2 to 3 tons of standard coal, accounting for 1/5 of the country's total consumption.

Low efficiency of energy use is also evident in mining process. Shaanxi Provincial Coal Industry Bureau deputy director Bai Hong said, "According to the national coal industry technical specifications" requirements, mine stopping rate should be not less than 75%, but now not a coal enterprise of Shaanxi province meet the requirements. The whole province coal resources recovery rate is less than 30%. This makes the mining of centenary reserve depleted within actually only thirty or forty years. The same case also appears in Xinjiang province. It is predicted that Xinjiang coal reserves accounted for 40% of the country, about 2.1 billions of tons. It is the central coal output attenuation after domestic important coal connection area. Municipal Coal Industrial Management Bureau, Xinjiang Coal Mine Safety Supervision Bureau deputy director Wu Jiachun said, at present

Xinjiang township coal mines average recovery rate was only 10% —15%, local state-owned coal mine is about 30%, direct state-owned key coal mines is less than 60%. Shanxi, Inner Mongolia and other Western energy producing coal-bed is thicker. Some is up to 50 meters of average coal seam thickness. However, some enterprises use only 4.8 meters high powered supports, directly from the intermediate mining, the waste of resources is difficult to estimate. Oil exploitation of integrated utilization rate is also low. Xinjiang oil field extraction average rate is 40%, and in Shanbei area it is less than 20%. This means that the buried crude oil per ton can only produce about 100 kilograms, while the remaining 800 kilograms are wasted. Significant waste of resources is because the petroleum exploitation enterprises started from cost considerations and refused to use the enhanced oil recovery technology of water injection.

Energy saving is imperative. The sixteenth conference of communist party put forward that China's Gross Domestic Product (GDP) should achieve the goal of quadrupling and how to ensure the energy required by quadrupling is thought provoking. The energy efficiency of China's tertiary industry has the gap of 3,056.13 U.S. dollars per tons of standard coal with Japan. It is more than the gap of 1,948.05 U.S. dollars per tons of standard coal with Japan in the secondary industry. The figures show that the tertiary industry energy saving potential is 1.57 times of the secondary industry energy saving potential. Currently, China's tertiary industry is not very developed, the proportion of output value and energy consumption proportion is not very high. In such case China still have so big difference, it can be predicted that in the process of striding for comparatively well-off society, the tertiary industry domination will lead to tremendous growth of China's energy demand (He and Wang, 2004). In 2010 China's goal is to achieve the 15%-20% decline of million yuan GDP energy consumption compared to 2005. Therefore, improving the energy utilization efficiency of the tertiary industry has great importance.

2.5. Electronic Waste Management Vacancy

Electronic products are closely linked with production and life. The electronic waste caused by environmental issues has become increasingly serious. Data shows, at present our country television society retains the quantity of about 37 million sets, refrigerators around 15 million sets, washing machine 19 million sets. Most of these appliances entered into families in the late nineteen eighties. According to normal use period of 10—15 years of calculation, there will be a home appliance upgrading peak. In the updating period, each year there are more than 5 million sets of televisions, 5 million washing machines, 4 million freezers. At present, China has about 20 million computers and 25 million mobile phones entering into families. The renewal speed is faster than other household

appliances. Currently about 5 million computers and millions of mobile phones will be eliminated (Feng, 2004). China's electronic waste management has the following three main problems:

First, due to the lack of a standard electronic waste management mechanism, management is in a state of disorder. Government, enterprise and consumers have insufficient understanding of electronic wastes. Electronic waste is not regarded as hazardous waste by the government departments. "The people's Republic of China Solid Waste Pollution Prevention Law" issued in 1996 was not specified on the electronic wastes. Electronic products manufacturers only provide some customer service warranty repair services, but do not assume the responsibility of electronic waste recycling and disposal, which is mainly done by the sanitation department. It has relatively strong administrative color with no economic benefits or economic benefits are low. Thus the industrialization operation can not be formed. A reasonable electronic waste management system should include the classification of waste, recycling, transportation, processing information, and other aspects. The qualification should be especially emphasized in the three latter aspects. Take two links of recycling and disposal for example, now China's electronic waste individual purchase phenomenon is very common. After the individuals buy the electronic waste, they make simple renovation repair. Then they make the second sale to the economically backward regions, or directly transfer to electronic waste disposal hands for the artificial treatment. This makes the regular manufacturers, who have the conditions for electronic waste batch processing, cannot get enough raw materials. And it effects the electronic waste treatment industrialization formation and development.

Second, industry investment is inadequate, production technology and equipment level is low. Due to lack of strong policy support, the investment in China's financing, investment, taxation and other aspects is inadequate to the electronic waste treatment industry. In fact the electronic waste disposal is not a complete technical problem. Some methods, such as pyrolysis technology, are technically feasible. However, because of the high production cost, the enterprise can not get economic benefit, and this requires corresponding policy support. In terms of technical processing means, currently China is still mainly based on artificial processing mode, and the mill type production mode is highlighted. The typical processing method is incineration and acidic fluid replacement metal. This workshop manual processing methods reduce electronic waste recycling resources efficiency on the one hand. On the other hand, the local environment deteriorates quickly.

Third, formal electronic waste treatment plants do not get enough raw materials. China's current electronic waste recycling situation is that on the one hand, a

large electronic waste is processed through non professional means; on the other hand, the professional processing factory, which is built by huge sums of money, can not get sufficient raw materials. The United States of America Peregrine group is located in the Nanjing suburb of Jinze electronic waste recycling plant. At present, Motorola, Samsung, NEC, Siemens, LG and other world class communication consumer electronics giant has become its customers, but it still faces underemployment phenomenon. Although it has the capacity of treating annually 50 thousand tons of electronic waste, metal, plastic and other processing line profits are needed to complement the deficit caused by inadequate electronic waste materials. Such idle situation obviously does not match the current electronic waste quantities of the Yangtze River Delta. The main reason for this is as follows: Firstly, the users (including business and personal) of domestic electronic information products do not have strong environmental consciousness. Currently, the main customers of Nanjing Jinze are foreign companies, and the local enterprises are not many; Secondly, the individual acquisition caused the retained raw materials. To establish a standard electronic waste recycling system is a key link that China must face in handling electronic rubbish problem. Otherwise, the professional processing factory can not compete with peddlers. Because professional processing means requires harmless treatment of hazardous substances in electronic waste, while the result of this will increase the cost of the enterprise (You and Xu, 2005).

3. PROBLEM DISCUSSION

From the perspective of SDS, China's business environment pollution and energy use inefficiencies involves many aspects. To sum up, it includes the combination of corporate responsibility, government responsibility and the public responsibility.

3.1. Corporate Responsibility

Environmental pollution and energy waste is essentially corporate social responsibility issues. From 2005 to 2007 Chinese corporate social responsibility performance, especially in environmental protection, China enterprises need to cause enough attention in the cognition and fulfillment.

3.1.1. Investigation and Analysis of Chinese Corporate Social Responsibility in 2005

In 2005 the Ministry of Commerce "WTO economy" magazine China corporate social responsibility development center set up an independent investigation mechanism and launched a research on corporate social responsibility in China. From March 2005 to mid August 2005, by the questionnaire designed by expert

team, telephone, e-mail and interview, it investigated various 1500 companies. 300 representative questionnaires are selected as samples. The preliminary data statistics and analysis of the problem are as follows (Yin, 2005):

(1) Have you heard of the following concepts?

A. Corporate social responsibility B. SA8000

C. The multinational company D. Not sure

The survey shows that 76% respondents have heard of "corporate social responsibility" concept, 42% heard of the SA8000 standard of enterprise society responsibility concept, 24% heard of multinational companies "production code" concept, 16% are not sure. The figures indicate export-oriented enterprises pay relatively high attention to CSR. Because China is still at the initial period, quite some enterprises have relatively obscure recognition.

(2) Have you ever accepted clients' corporate social responsibility examination or authentication?

A. Often B. Occasionally C. Never received

Survey shows that 11% respondents are often subjected to clients' corporate social responsibility inspection or certification, 39% subjected to occasional inspection or certification, half of respondents have never received. This set of figures show that, in the global supply chain link (engaged in processing, OEM production) partial enterprise received social responsibility examination or authentication. However, the popularization is not very wide, but the inspection or certification is in a rapid upward momentum.

(3) Has your business set the following management departments?

A. corporate social responsibility department

B. sustainable development department

C. environmental management department

D. public relations department

Survey shows that 8% enterprises have corporate social responsibility department, 8% sustainable development department, 16% environmental management development, 37% the public relations department. Data show that most of the enterprises in China have not set up a special social responsibility of the enterprise management mechanism. That is to say social responsibility is not regarded as a

special work by these enterprises.

(4) Has your business issued a corporate social responsibility report and published the information of CSR performance?

A. often B. occasionally C. had not released

Survey shows that 2% respondents often issue CSR report, 26% occasionally issue that, 71% did not released it. Data shows that most of the enterprises in China have not set up corporate social responsibility report mechanism. By contrast, many multinational corporations published CSR report annually with the president personal signature and it has become a system.

(5) Has your business benefited from CSR?

A. often B. occasionally C. never

Investigation shows that 8% of the surveyed companies often benefit from CSR, 42% occasionally benefit from it, 50% never benefit from it. Our data show that stimulating mechanism to promote CSR is not perfect.

The above analysis shows that in 2005 China business for social responsibility concern has not yet to reach a higher level, the enterprise internal management needs to be further strengthened.

3.1.2. 2006 China's Corporate Social Responsibility Investigation and Analysis

The corporate social responsibility investigation was formally launched in July 2006 and ended in late December, the whole process last 5 months. The survey was open to the enterprises or groups legally registered and operated in Chinese territory for more than 3 years. And it focused on the state-owned enterprises, private enterprises and foreign enterprises which operated in good condition and had outstanding performance in fulfilling their social responsibility during 2005-2006 in China. The enterprises participated in the survey through different ways, such as the voluntary enrollment, the organizing committee consulting, professional recommendation, *etc*. In the initial stage, enterprise information acquisition is sampled according to geographical, economic type, size and media evaluation elements. A total of 980 enterprises were sent with questionnaires, and 517 valid questionnaires were collected. The assessment on these 517 enterprises CSR fulfillment passed through the links, such as the enterprise information standardization calculation, professional survey polls, the public votes, enterprise on site research and unannounced visits, expert valuation, *etc*.

The survey results show that the social responsibility consciousness of all kinds of

enterprises is deepening. Small and medium-sized enterprises show no significant difference in the social responsibility index compared with large enterprises, domestic enterprises performance is not inferior to foreign capital enterprise. However, domestic enterprises, especially the private enterprises, are obviously insufficient in terms of organization system construction. The powerful impetus for enterprises to fulfill their social responsibility is the legal norms and social supervision. Enterprises and the public have significantly different understanding of CSR: the public is most repulsive to the enterprise behavior which damage staff right and consumers interests.

Among all the participants in the survey enterprises, enterprises of various ownerships are evenly distributed and have good representation. From the social responsibility index analysis, domestic enterprises on the whole is obviously better than foreign-funded enterprises, even domestic private enterprises are better than the foreign capital enterprises in most indicators. Therefore, in contemporary China, the CSR consciousness of all kinds of enterprises is deepening. Regardless of size, Chinese enterprises are actively bearing the social responsibility. In organization security and strategic management, foreign capital enterprises are obviously superior to Chinese enterprises. As for the organizational security of CSR management measures, foreign enterprises generally demonstrated more regularly, daily and specialized. To some extent, the CSR consciousness takes an important role in enterprises strategic management. The complete organization security enable the foreign enterprises pay more attention to the sustainability and operability of the activities. They have more mature and systematic set of management method to track the implementation and follow-up services. Thus the social effect is broader and more prominent. For example, almost all foreign enterprises regularly publish the documents, such as "social responsibility report", "enterprise citizen report", which promote the enterprises to fulfill the social responsibility. From early 2006 China enterprises began to formally publish CSR report by large state-owned enterprises. Another example is the charity activities. Foreign companies usually have obvious activity area and direction, generally with the form of project operation, paying attention to the cooperation with authorities. They have a special person of full monitoring and evaluating. It is as strict as an investment project management. While China enterprises are fairly arbitrary, and lack of management and promotion. Investigation discovers that small and medium-sized enterprises have no specialized departments and personnel to manage social affairs and lead strategic research and implementation. Therefore, compared with foreign enterprises, China enterprises, especially private enterprises and small and medium enterprises are not mature in practice. This shows that many Chinese enterprises understanding of CSR strategic importance is insufficient, the target is not specific. They fail to integrate CSR and enterprise management, and the management system is not standardized. Thus the

implementation result is affected.

Among the enterprises involved in the investigation, the manufacturing industry enterprises are particularly prominent, well beyond the department distribution throughout the industry. This kind of phenomenon has three reasons. One is because the manufacturing industry enterprises have larger scale of general assets and the scale of enterprises and the sense of responsibility have higher correlation. The second reason is that the manufacturing industry usually requires more resources and is easy to produce externalities. It involves more extensive stakeholders and is apt to cause social attention. The third reason is that the manufacturing industry is the fountainhead of reproduction and plays a core role in the national economy lifeline. So it is subject to more government regulations, which have powerful drive effect. The investigation discovers that many manufacturing enterprises, especially the state-owned enterprises, hold that the explicit government stipulation and the harmonious relationship with the community residents (including the farmer) are the important power to fulfill their social responsibility. In other words, the absence of external regulation and supervision is one of the reasons leading to the adverse consequences.

Overall, the current Chinese companies have the highest recognition on the social welfare responsibility, reaching 75.2%. Next is the recognition of economic responsibility, 66.5%. While the awareness of the legal responsibility, environmental responsibility and corporate culture is lower, only about 35%. From the view of ownership, the CSR awareness of all kinds of enterprises is similar. The state-owned enterprises awareness of CSR contents are higher than other types of business. This may indicate the state-owned enterprises undertake more arduous tasks and restricted by greater regulations. Foreign enterprises understanding of environmental responsibility is the most prominent, but the lowest recognition of financial responsibility. While private enterprises have very low sense of law and environmental protection. The large sample random survey investigation to the general public finds that the public understanding of CSR focuses on the environmental protection, employee rights protection, product quality and after-sales service. The public response to the charitable contributions is very cold, only 17% awareness. In contrast, almost all business shows extremely important attention to it. It can be found that a considerable part of enterprises do not fully take into account of the public needs in their CSR awareness and implementation. Many companies are keen to donate and market public service with the aim to expand the influence and establish a positive image. However, they do not seriously consider the purpose of CSR. Society is constituted by specific persons. The behaviour, which does not meet the real needs of people, is not really responsible behaviour.

According to the survey, the actions and events, which strongly reflected by the public due to lack of CSR, are as follows: Firstly, the occupational diseases and industrial accidents are caused by lack of protection. The typical events are the Guangdong battery factory occupational incidents and the frequent occurrences of coal mines. The second are the unhealthy food and counterfeit drugs. The typical events are the 'Red Egg' event and 'Turbot' event. The third are the environmental pollutions. Typical events are the Songhua River pollution incident and environmental deterioration events in various areas. The fourth are a variety of product quality and after sale service events. What makes the public feel most objectionable are the events lack of CSR, reflecting the employee basic rights and consumer rights. These problems are either caused by the environment, or produce adverse effects on the environment. They are closely related to the public health, safety and quality of life. Thus the public pay attention to them. These problems not only illustrate the lack of CSR sense, but also reflect the absence of government rules and norms, and show the importance of public opinions. Therefore, the construction of CSR needs the enterprise own efforts, and the active participation of the whole society as well.

2006 China CSR survey showed that China's current CSR concept and performance status was still incompatible with the rapid economic growth situation. On the one hand, from the overall point of view, CSR awareness needs to be further improved in order to prevent frequent irresponsible behaviours, especially the violation of employees, consumers benefit and environment pollution. On the other hand, many local enterprises are still not mature enough in making the CSR strategy and building the corresponding management system. Compared with developed countries, companies seem to lack of experience in standardization and organization. This makes local business cannot form an organic link between CSR and business performance. Consequently, the effect of CSR is compromised and the driving force to fulfil responsibility is also effected (Shan, 2007).

3.1.3. 2007 Chinese Entrepreneurs Survey Analysis

In 2007, in order to understand CSR performance, Chinese entrepreneurs survey system began to work in two aspects: one was the enterprise operators' evaluation of the peer companies; the other was the perception of CSR motivations. By 4586 entrepreneurs questionnaires, the final conclusion was that enterprises CSR consciousness was constantly improving. To enhance the image was used as the primary motivation of CSR performance. What was notable is that the choice of "enhancing corporate brand image" proportion (71.3%) was much higher than the choice of "contributing to the social development" proportion (38.9%). This showed that the entrepreneurs had biased understanding of social responsibility.

How did the entrepreneurs summarize the reasons of not to fulfill social responsibility? According the China entrepreneurs survey system summary, the reasons are as follows: the insufficient understanding of social responsibility, CSR theory and method, the enterprise management difficulty, poor business operator quality, the lack of a good social credit environment and incomplete performance of relevant sectors and so on. The finding shows that enterprise managers think the most prominent irresponsible behaviors are environment pollution and no credit. The investigation covers 17 kinds of irresponsible performance. The results showed that the choice of "environmental pollution" proportion is the highest, reaching 54.1%. More than 30% proportion choices are related to no credit. For example, the production and sale of fake and shoddy products (45.6%), tax evasion (42.5%) and unfair competition (39.6%), *etc*. In general, according to business operator, some enterprises irresponsible performance is mainly manifested in the legal responsibility and ethical responsibility.

From different groups, the finding shows that east area enterprises, large enterprises, state-owned enterprises, listed companies and profit enterprises operators show more concern to the "environmental pollution" problem. This also shows that small and medium-sized enterprises have the most prominent problems of damaging natural resources and causing environmental pollution. At present, no matter the east coast or the Midwest, small and medium enterprises do exist the externalities. In the central and western regions which are rich in coal resources, small and medium-sized enterprises have the obvious problems of natural resources destruction and environment pollution. In the eastern coastal developed area private enterprise offshore pollution is also very serious. Half of the Pearl River Delta land is polluted by heavy metal. This has become the problem that the central government pays great attention to. On the other hand, production and sale of fake and shoddy products is also environmental pollution performance. Because these products consumed a large amount of resources and shortly after production they become waste due to quality problems. If not properly treated, it will have a negative impact on the environment.

In view of the above situation, business operators offer a proposal for better CSR performance. Finding shows that more than half of the business operator choose "establishing and improving related laws and regulations system" (54.7%) and "raising CSR awareness of business operators" (50.6%). Other measures are: "to promote the community for better performance of their social responsibility" (28.8%), "to improve system environment" (26.8%), "to increase penalties for illegal enterprises" (24.7%), "to promote government leadership of CSR standards" (21.5%), "to advocate Chinese traditional cultural essence" (21%), "to increase public opinion propaganda and public opinion supervision" (18.6%), *etc*. Investigation shows that enterprise managers should be fully aware of the

necessity to improve their quality. And at the same time, the government and all sectors of the society should provide strong support (Li, 2007; Shao, 2007).

3.2. Government Responsibility

The above illegal polluting environment behavior by the large number of small and medium-sized enterprises is directly related with the lax supervision by the local government. The enterprise operators survey also finds that the government has the responsibility vacuum in guiding enterprises to take social responsibility.

3.2.1. The Inadequacy and Ambiguity of Laws and Regulations

State Environmental Protection Administration Deputy Director Pan Yue's view on China's environmental legislation view is: "there are a number of environmental legislations, but a few work; many laws seem to be on the idealistic level; according to the current environmental situation, many legislations exist blanks, and with lax enforcement and system crossover, the legal enforcement result is directly affected." State Environmental Protection Administration Regulations Secretary Yang Zhaofei thinks that the current environmental legal system has many defects, which manifested specifically in seven aspects: The first is the environmental law system is still incomplete. Some important legislation has blanks, such as the lack of laws and regulations concerning soil pollution, chemical management, biological security, the protection of genetic resources, nuclear safety, *etc.*; The second is some environmental management systems do not adapt to the needs of development, some environmental management system lack of legal basis, some environmental management systems have the follow-up work to be strengthened; The third is the lag support of environmental laws, many environmental laws, regulations, standards, policies and regulations could not launch, affecting the law implementation; The fourth is lack of a special environmental law to restrict government behavior, local protection to interfere with the normal law enforcement phenomenon is common; The fifth is a civil compensation for environmental damage has no legal basis, vulnerable groups can not get necessary compensation after environmental damage; The sixth is the lack of environmental damage social insurance law, some major environmental accident compensation has no source of funding, and the consequences can only be covered by the state or shared by the victims; The seventh is the weak environmental laws and regulations in the condemnatory strength, lack of coercive means, the illegal behavior has low cost; law-abiding behavior has high cost, the cost of law execution is high; it is difficult to get the evidence, provide proof and make implementation (Yang, 2006).

China's environmental law is the general law which usually have a sense of

uncertainty. This allows the State Council, state agencies and local governments add implementation details. The most daily national environmental law implementation is at the local level. So the local people's congresses and local government agencies can make their own national laws and regulations, notifications and other executive orders in response to the state law. Although these enacted laws and regulations must be consistent with national laws and regulations, they allow the flexibility in interpretation of the requirement, usually they constitute environmental objectives. In many cases, the actual compliance and enforcement depends on the area of concern, the involved individuals and the ability of business to comply with the law. In some cases, the wealthy investors are required to adopt more stringent environmental policy. While in other cases, the environmental requirement is reduced in order to attract local and foreign investment (Hu, 2004).

When new products and new technologies are created one after another, new situations and new problems follow that. Pollution disputes contents become more complex. As the regulations and standards have not kept pace, the difficulty of handling is increasing. For example, regulations have already provided for the construction noise and night construction management in the city, there is no such law in towns and rural areas; Some of the emerging contaminants, such as light pollution, the monitoring methods standards and emission standards have not issued in a timely manner; The environmental damage has its own specialty, often causing both material and spiritual losses. But at present there is lack of economic compensation and calculation standards process, *etc*.

In addition, there is no law to make a clear definition of the relationship between the central and local environmental management. This makes supervision lack of legal basis and monitoring standards unclear. The monitoring system is not perfect. The systemic monitoring program is inadequate (Hu, 2005). These conditions make the supervision of central government ineffective to the local government. So, the 'softening' environmental policy implementation mechanism often occurs. For example, the mayor's office interfere the Environmental Protection Agency (EPA) decisions on economic land use; Another example is that the mayor's office asked the EPA to return the fine to the company, because the company has financial problems and the fine will make the situation of company even worse (Ma, 2000).

3.2.2. Insufficient Environmental Investment

Empirical study shows that economic growth and ecological environment have the inverted U relation, reflecting stage feature of the environmental protection requirements and economic development. According the OECD, most developed

countries begin to carry out the large-scale of pollution control only when GDP of average per capita exceeds $8000 to $10000, after that the environment pollution turns a downward trend. While in the emerging industrial countries the environmental quality starts to be improved when GDP of average per capita exceeds 2000 US dollars to 4000 US dollars. Currently, the most pressing issue of China is economic development. Its per capita GDP has just reached 2000 U.S. dollars. In such circumstances, China's environmental protection is very difficult to go beyond the social and economic development level. Environmental protection capital requirement expands quickly, exceeding the national current input capacity.

The huge capital demand is determined by the grim environmental situation and environmental goals. China is still in the low stage of development of GDP per capita. However, the compound environmental problems have occurred, such as serious industrial pollution, city life pollution, environment system function imbalance, new pollution and global environmental problems. In order to deal with this challenge, the capital investment needed is undoubtedly huge.

At present, China's environmental protection funds robust demand basically depends on the following factors: (1) Along with the acceleration of industrialization and urbanization and population continual development, the long-term extensive type economy growth adds the overall pressure of environment management; (2) The pollution governance is becoming increasingly difficult. In the past the simple technology, less investment will be able to solve the problem is becoming more and more scarce. There is apparent change in pollution control difficulty and demand extent for funds. The cost of environmental governance increases continuously; (3) The contamination nature changed significantly. Regional, watershed, non-point source pollution and life pollution have gradually become the new contradiction. To resolve these pollution need more large-scale investment in environmental protection, compared with the traditional industrial end treatment; (4) There is too much environmental investment historical bills. For many years China's investment in environmental pollution is far lower than the basic security level, government environmental burden is getting heavier. The ecological environment of our country is in the local area is improved somewhat, but on the whole it still shows exasperating trend.

According to the World Bank calculations, in 1997 China's environmental pollution and destruction caused the loss of 7.7% of GDP; in 2003, China environmental pollution and destruction caused the loss of 15% of GDP, while China GDP increased was only 10% in the same year. Environmental pollution and environmental destruction caused huge economic losses, also it led to the

quick state environmental protection expansion, exceeding the corresponding stage capital supply capacity. According to the World Bank estimates, during the "Ninth Five Year Plan" period the environmental protection fund plan amounted to 450 billion yuan, and the actual investment was 360 billion yuan, leaving the gap of 90 billion yuan; During the "Tenth Five Year Plan" period only water pollution control fund had the gap of 40 billion yuan.

In addition, China current overall construction of well-off society will bring a new round of economic growth peak and rapid industrialization, which has further increased the pressure of environmental protection. Both the expansion of the scale of economy and the economic growth are based on the natural resources. At the same time substantial waste will be discharged to the environment, which will be bound to bring greater pressure to China originally weak ecological environment. According to the "2005 China environment green book" prediction, in the next 15 years, China's population will reach 1.46 billion yuan by 2020, economic gross will break up two times again. The ever growing scale of economy and population creates enormous pressure on the resources and environment. Now according to the current controlling level of pollution and resource consumption, the pollution load will increase by 4—5 times, and environmental governance capital requirements will consequently rise.

Currently, the main cause of inadequate investment is that local government finance and taxation supporting conditions are not equal to the environmental responsibility, enterprise financing channel is not smooth and the economic policy is not perfect. In the reform of the fiscal and taxation systems, the central and local financial power division does not consider environmental governance factors. There is great contrast between the system of central and local tax distribution and the system of the central and local government environmental responsibility distribution. Large and medium-sized state-owned enterprises profit shall be handed over to the central, and the burden of pollution control is left to the local government. A lot of historical bequeath problem, environmental pollution problems after the business bankruptcy are all fallen on the shoulder of local government. The financial resource of poor area is more difficult to bear the pollution control. The "211 environmental protection project" is in a state of "channel without water, account without money" in a considerable parts (Su and Liu, 2008).

3.2.3. Administrative Division Barriers

Administrative division refers to the relative independence of the administrative region and some institutions. Since the implementation of prefectures and counties systems, the small administrative regional management by hierarchical

delimit is a kind of progress of social management. It will enable the decree of the central government to be fulfilled more effectively and specifically. If the administrative regions can keep step with the national laws and policies harmoniously, the effect will be better. Conversely, if they are not unified, the national policies and laws will be undertaken disorderly. In environmental management, China has the national unity of environmental regulations. However, the implementation of different parts is different, the environmental consequences will be not identical and the overall situation is deteriorated. It is more prominent in the river and lake basin sewage governance. A river flows through the town of a few counties or provinces. Some counties will limit the sewage water, while some will not. What is more, the upper region destruction consequence of the environment is often dealt with by the downstream regions. It seriously hurts the environment governance enthusiasm of the downstream area and forms a malignant competition.

The most important content and characteristic of administrative division is financial segmentation, *i.e*. the relatively independent financial revenue and expenditure. The central government to the local government, higher administrative region to the lower administrative region implements separate tax system. Due to the different levels of economic development and resource condition, there is great gap between each administrative regions. Take county as an example, some developed prefectural finance income is high. In addition to the full payment for civil servants and teachers according to the state provisions, there is some bonus for construction; In some counties, the finance income can only guarantee wage with no support for construction; and in a lot of counties, the finance income cannot protect wages, and even can pay for the salary for half a year or a few months. Most of the counties are agricultural counties. The agricultural tax relief decreases the financial income. The exacerbated financial difficulties make them rely on the few small scale, lagged technology, obsolete equipment and low efficient enterprises. These small, old and backward enterprises consume great resources and cause serious pollution. They are unable to engage in technical transformation, and do not meet the environmental protection requirements. According to the provisions, the majority of them should be closed, stopped, combined and changed. If so, the county finance is more difficult to fulfill the payment of wages, which will influence the social stability. In these places the law enforcement agencies and county governments find it difficult to close down the pollution enterprises, which will also secretly open up after the temporary pressure (Wang and Zhang, 2005).

Administrative division makes the separation of environmental protection responsibility between the central government and local government not clear. This results in the coexistence of environmental protection investment repetition

and vacancy. The governments at all levels cannot fulfill their responsibility of environmental protection. The central government should be responsible for some environmental protection events with national public goods nature, such as inter-provincial river basin water environment management, national nature reserve management, historical pollutant treatment, international environmental convention compliance, nuclear waste disposal facilities construction and the national environmental management capacity building, *etc*. They are seriously lack of financial support. At the same time, the local government should be responsible for the environmental events with local public goods nature, such as the local jurisdiction of water environment management, city environmental infrastructure construction and environmental management capacity building. They are required by local financial arrangements. However, because environmental protection responsibility division is not clear, the local environmental protection property does not reach the designated position. The phenomena of local government "rent-seeking" for the help of central government frequently occur.

At present, the two main relatively prominent consequences are in two aspects: First, it strengthens the local protectionism, which constitutes the main obstacles for various levels of governments to properly fulfil their environmental responsibilities. Under the current system, the mismatch of powers and financial authority leads to the inconsistency of central and local interests. The local governments prefer to pursue the regional interest maximization. So in implementation of environmental policies, the local governments would rather develop economy than protect environment and pass the responsibility to the central government. Normally, in order to protect the local revenue sources and interests of various administrative departments, the large heavy polluting enterprises, which make huge contribution to the local government tax, will be sheltered. For the large area or basin-wide pollution problems, the local governments always believe that it is the central government responsibility, so their attitudes are not serious. Secondly, the central government transfer payment cannot effectively solve the current problem of insufficient investment in the local environment. From the current relationship between central and local taxation, the tax revenue are concentrated at the central government, and the local tax revenue is not stable. Even many city and county governments finance actually have gone bankrupt, which makes the central government take the high transfer payment responsibilities and costs. However, because the source problem of the central and local powers mismatch is not solved, and there still lacks of clear legal norms of the central transfer payment system, the central transfer payment structure is not effectively addressed, the local government investment for environment protection cannot reach the proper place (Su and Liu, 2008).

3.2.4. Insufficient Support of the Small and Medium-sized Enterprises (SME)

According to the statistics of "2004 China Industrial Economic Statistical Yearbook", there are altogether 196,200 state-owned and non state-owned enterprises throughout China in 2003. Among them, there are 1,948 large enterprises, whose proportion is 1%; there are 21,647 medium enterprises, whose proportion is 11% and 172,600 small enterprises, whose proportion is 88%. In terms of economic and social benefits, in 2003 the total profit and sales of China's large enterprises are respectively 46% and 36.7% in proportion. This shows that China's large enterprises economic benefit is good. The medium-sized enterprises product sales accounted for 32.9%, less than large enterprises and higher than the small enterprises. Small enterprise employment proportion was 43.9%. In 2003 the SME sales revenue, total profit and employment proportion were respectively 63.3%, 54% and 77.3%. So the position of SME in China's national economy is obvious.

However, the above survey shows that in recent years, especially in the Midwest regions, the non-public SMEs have prominent problems in the economic development. Environment pollution and sale of fake and shoddy products become the highlighted performance of not fulfilling their social responsibilities. The reasons are as follows: the enterprise infrastructure condition is poor; the labor force is cheap while the overall quality is low; they are lack of financial support and difficult to get loans; the entrepreneurship policy and the preferential tax are in need; it is hard to get the necessary information, consulting and training from the current market economy. Without good soft and hard environment conditions and fair competition market economy mechanism, the non public Midwest economy is difficult to achieve further development. And the environmental protection issue is just the castles in the air. What the central government must pay special attention to is two aspects: one is how to strengthen the local government support for the SMEs; the other is how to effectively implement the public service and supervision in order to achieve sustainable and fair development. At present, the SMEs training and operational guidance system needs to be supplemented with the contents of the coordination of labor relations, environmental protection and resource conservation (Shao, 2007).

3.2.5. Limited Environmental Information Content and Channels

The People's Livelihood Index find that when the public have environmental problems, they do not directly ask the environmental protection department for help, but go to the local neighborhood committees. This means that they do not have sufficient cognition of the professional environmental channel. This result comes from the "The People's Livelihood Index—China Public Environmental

Index 2005 Annual Report", revealing China's first environmental index, supported by China Minsheng Bank. It is guided by the State Environmental Protection Administration, edited by China's Environmental Culture Promotion Association Organization, and managed by Beijing Horizon Research Consultancy Group throughout the whole process. For the domestic environmental events, such as 26 degree air conditioning festival action, the public obtain the information from the new media. This survey report also shows that the main environmental information sources of the public come from newspaper and television while few from other media. However, because of a large number of news reports on a great deal of environmental problems by the media, the public have a higher environmental sensitive degree of the negative issue in the daily life. As for the positive environmental issues, such as sustainable development, natural protection area, they do not show much attention. There are fewer media reports on the things like through which channels the nearby environment problems can be accurately reflected and how to solve the problems. Investigation discovers that less than 20% of the public know the free hotline "12369" to report the national environmental problems. And among this group, only 9.2% have played the phone. 83.6% of the public do not know the free hotline and how to use the phone.

It is not difficult to find that the public access to the environmental information channel is still very limited and the information is not sufficient. Therefore, what the government needs to do is: increase the form and content of environmental protection propaganda; closely link environmental information with people's life; expand environmental information flow pathways and areas; meet the public desire to know the environment; smooth channels for public participation and build a platform which is based on the public and deep into public life network. Thus the environmental protection notion can be spread into tens of thousands of households.

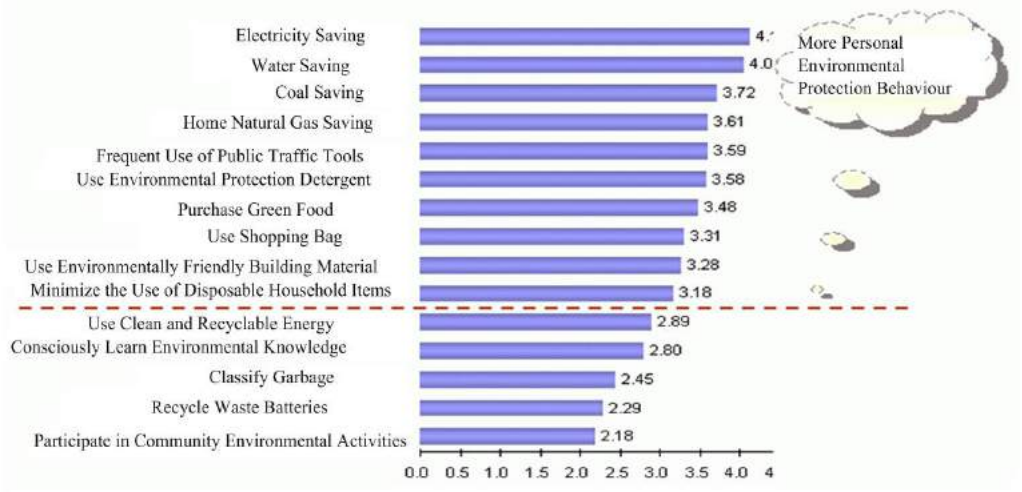
3.3. The Public Responsibility

With the profound social and economic reform caused by the environmental protection, the public has gradually become a social force to promote environmental protection. However, the investigation discovers that the characteristics of public participation in China are insufficient.

3.3.1. Environmental Protection Behavior: Personal Space beyond Public Environment

In 2005 the people's livelihood index survey found that at present the public pays close attention to the public space environmental condition, such as air, water, noise, attaching 34% attention degree. To some extent, it indicates the public

expectation of clean, tidy and pollution free environment. However, the public participation in the environmental protection behavior is focused on personal living space, mainly with simple, superficial environmental behaviors, such as saving water and electricity in daily life, *etc*. The environmental protection behavior, which can quickly bring improvements and benefits, is greatly respected. While little attention is paid to consciously learning environmental knowledge and using in daily life and actively participating the public welfare activities. The differences between the public concern and behavior show that the public does not connect the public space environment protection closely with personal responsibility. When the environmental problems affect the personal life, they will take action, which also belongs to the "personal interest maintenance" behavior. In order to promote public environmental protection behavior, the "responsible citizen consciousness" is expected (see Fig. **7.1**).



Source: 2005 People's Livelihood Index—Chinese Public Environmental Protection Index Report edited by Chinese Environmental Culture Promotion Commission, 2005

Fig. (7.1). Scores of Public Different Environmental Protection Behavior.

The investigation discovers that at present China's public consciousness and knowledge of environmental protection has increased to a certain extent. However, environmental participation ability is poor, *i.e*. there is more speaking than action. What is more worthy of attention is that the vast majority of the public do not know how to participate in the environmental activity once they encounter specific problems.

Investigation data shows that in recent three months the public who do not frequently participated in environmental protection activities reached 80%, while

the frequently participating public accounted for 6.3%. The gap is very significant; At the same time, when the public face specific environmental activity, 40% will take "wait and see" attitude. They do not have strong consciousness of participation and the group psychology is prominent.

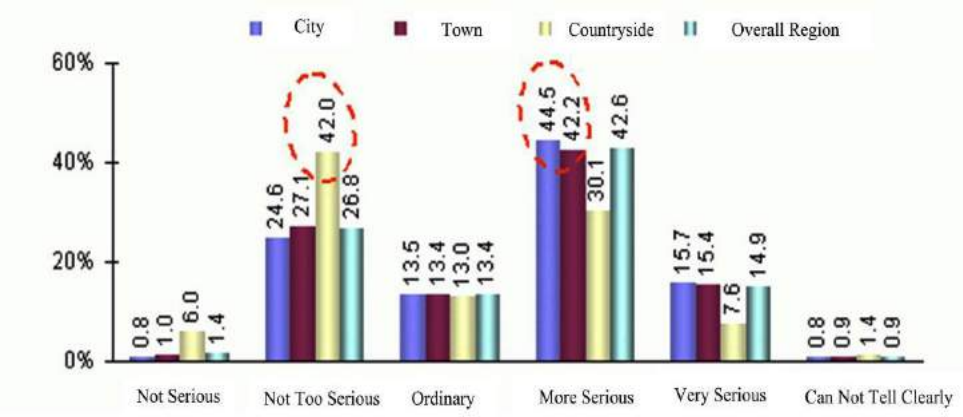
3.3.2. City Residents: Insufficient Energy Conservation Behavior

From the "electric shortage" in the Yangtze River Delta to the "coal barren" and "oil shortage" in the northeast, east, south and southwest China, the phenomenon disclosed China's energy shortage problems. The city residents all identify with it. 70.4% of city residents believe that China's energy shortage problem is serious, 16.7% think it is not serious. Although they have certain energy crisis consciousness, the city residents energy conservation behavior is generally inadequate: they will do better for their own interests with direct and easy environmental protection and energy saving behavior, while they do not perform well enough in the activities which will cause inconvenience to the life or need a certain economic investment. The survey shows that respectively 88.1% and 81.7% of respondents said they usually paid more attention to save water and electricity. However, only 34.2% said they would try to reduce the disposable supplies, such as disposable chopsticks; only 19.7% people would classify the living rubbish; only 8% would use clean and renewable energy. In order to promote the city residents energy conservation behavior, interest constraint is one aspect. To strengthen the scientific and technological research and development to improve the energy saving technology and reduce the clean and renewable energy use cost is another important aspect.

3.3.3. Difference Between Urban and Rural Areas: Rural Resident Lower Cognition

As shown in Fig. (**7.2**), relatively speaking, rural resident cognition of the environmental problems severity is below the city and town residents. To some extent, this indicates that the environmental protection work did not go deeply in the rural areas. From the perspective of public participation in environmental protection activities, no matter city, town or the countryside, lack of participation is obvious. Comprehensively speaking, the city and town dwellers have higher cognition and lower action; while the rural residents have lower awareness and lower action. They need general environmental knowledge. The main reason for such difference is the imbalance between China's rural and city environmental protection development. For example, the environmental protection infrastructure and environmental management is mainly focused on the city and city residents can enjoy more public services. Additionally, with the continual urbanized construction in recent years, the industrialization pollution in many cities has

affected the rural areas. There is 70% of the population live in the rural areas, and the rural environment capacity is very limited. Therefore, if the city-oriented environmental protection policy is not reversed, the farmers' environmental awareness is hard to improve. Consequently, the deterioration of rural environment will bring bad influence to the city ecological environment.



Source: 2005 People's Livelihood Index—Chinese Public Environmental Protection Index Report edited by Chinese Environmental Culture Promotion Commission, 2005

Fig. (7.2). The Public Cognition on the Local Environment Problem Severity.

3.3.4. 451 Questionnaires Analysis

From December 2010 to March 2011, 500 questions were distributed, including the electronic ones through network media, with the help of many people. 451 effective questionnaires were collected. 90.2% of questionnaires were efficient. The survey data has strong representativeness and universality (Ye, 2012). From the perspective of respondents' geographical distribution, the questionnaires covered Beijing, Shanghai, Tianjin, Chongqing four municipalities directly under the central government, Hong Kong, Macao, Shenzhen, Xiamen special administrative regions, as well as other provincial cities (except Tibet and Taiwan) and some prefecture-level cities. It is quite a geographic coverage; From the perspective of the age distribution of the respondents, the age are ranged as under age 18, 18 to 25, 26 and 30, 31-40 and 41 to 50 years old, 51 to 60 years old, above 60 years old, and the age distribution ratio were 2%, 34%, 22%, 34%, 14%, 4%, 14%; From the perspective of the degree distribution of the respondents, the degree distribution is from low to high respectively: 12% of high school, 17% college, 47% undergraduate, 22% master, and 2% doctor. Middle and high education backgrounds are in the majority. From the perspective of respondents' social identity, there is 56 percent of enterprises staff and 44 percent

of non-business people. Among the enterprises, the directors accounted for 6%, the general manager 10%, the department manager 31%, and the general staff 53%. Among non-business people, there is 51 percent of teachers and students, 32 percent of civil servants, 14 percent of agricultural personnel and 3 percent of retired people. Basically, it shows a broad representation, covering all kinds of social identities. From the perspective of respondent's unit scale, 100 people account for 26%, 101-101 people account for 28%, 501-1000 people account for 14%, 1000-3000 people account for 10%, above 3001 people account for 22%. It quite evenly covers the units of different sizes.

The questionnaire is mainly about the survey respondents' understanding of the status quo of China's resource environment and reflection on the current situation, problems and future of the enterprises.

The percentage of the selection of questionnaire design and question options is now selected, as is shown in the Table **7.3**.

Table 7.3. The Questionnaire on Corporate Environmental Responsibility.

Questions, Percentage of people selected, Options	**A**	**B**	**C**	**D**	**E**
1. The "twelfth five-year" is put forward in the face of increasingly strengthening resources and environment constraints. We must strengthen the crisis consciousness, establish green, low carbon development notion, focus on energy conservation and emissions reduction, improve the incentive and constraint mechanism, and speed up the construction of resource saving and environmental friendly mode of production and consumption patterns to enhance the capacity of sustainable development. What is your attitude to this idea?	Strongly agree 58%	Agree 26%	Relatively agree 11%	No clear attitude 3%	Against 2%
2. Protecting the environment and saving resources is the top priority of human long-term survival and corporate sustainable development. Your attitude to this view is:	Strongly agree 58%	Agree 26%	Relatively agree 13%	No clear attitude 2%	Against 1%
3.According to the intergenerational equity theory, the lateral fairness of the generation and the longitudinal fairness of generations should be achieved. The former should give the countries fair development rights, equitable resources and the right to use the environment; The latter indicates that natural resources and environment, which human beings rely on, is limited. In the modern age, people can't damage future generations, because of their own development. The future generations should enjoy the rights of natural resources and clean environment. Your attitude to this view is:	Strongly agree 45%	Agree 35%	Relatively agree 15%	No clear attitude 4%	Against 1%

(Table 7.3) contd.....

Questions, Percentage of people selected, Options	**A**	**B**	**C**	**D**	**E**
4. At present, per capita arable land in our country is only about 1/3 of the world's per capita level, and per capita freshwater resources are less than 1/4 of the world's per capita level, and per capita crude oil is only about 8.6 percent of the world's per capita level. Our country is poor in resources, and saving resource is around the corner. However, the energy consumption of our country is 4.8 times of the worlds per unit of output, and energy utilization rate is only about 30% of the world's average level. Therefore, it is imperative for the enterprises in our country to switch the extensive operation of resources to economical intensive management. Your attitude to this view is:	Strongly agree 46%	Agree 34%	Relatively agree 17%	No clear attitude 2%	Against 1%
5. 45% of the world's steel production, 62% of copper production, 22% of aluminum production, 40% of lead production, 30% of zinc production, 35% of the paper products come from renewable resources recycling, and similar resources recycling situation in our country is far worse. Therefore, our country should vigorously develop circular economy (such as the implementation of renewable resources recovery and waste recycling system, promote the resources recycling industrialization-developing application source reduction, recycling, remanufacturing, zero emissions and industrial link technology, *etc*.). Your attitude to this idea is:	Strongly agree 49%	Agree 31%	Relatively agree 18%	No clear attitude 2%	Against 0%
6. In your opinion, the primary cause of environmental pollution and resource waste is:	Weak government regulation 39%	Enterprises pursue economic interests 35%	Lack of advanced technology 11%	Our society lacks environmental awareness 15%	
7. How much responsibility do you think the enterprise should take for the environment?	Very important 25%	Important 60%	Average 12%	Not indispensable 2%	No Responsible 1%
8. Do you think that Chinese enterprises only focus on economic interests and ignore their corporate environmental responsibilities currently?	All are the same. 13%	Most of them are so. 67%	Generally, they are the same. 17%	A little part are the same. 3%	It is not so. 0%
9. Are you satisfied with the current performance of corporate environmental responsibility	Strongly satisfied. 5%	Satisfied. 22%	Not satisfied. 57%	Strongly unsatisfied. 14%	It doesn't matter. 2%
10. Do you think it is good for enterprises to take environmental responsibility and improve their corporate reputation?	Very useful. 40%	It has some benefit. 51%	There is no benefit. 5%	There is no relationship. 2%	No idea. 2%

(Table 7.3) contd.....

Questions, Percentage of people selected, Options	**A**	**B**	**C**	**D**	**E**
11. Do you think that enterprises actively fulfilling the environmental responsibilities of the enterprise will increase their cost?	It will add a lot of cost, and it doesn't make any profit. 14%	In the short run, it will increase the cost, but in the long run, the benefit will be greater than the cost. 76%	Instead of increasing costs, companies can cut costs. 6%	No idea. 4%	
12.The main reason that you feel that the enterprise can fulfill its environmental responsibilities is:	The improvement of consumers' environmental consciousness and the expansion of green consumption demand 34%	The social public and investors are increasingly concerned about the environmental performance of enterprises 33%	Government environmental regulations are improving day by day 27%	The development of economic globalization and the rise of green trade barrier 6%	
13. When you see people who waste resources and pollute the environment in your work and life, what are you going to do?	Objection and stop 23%	Objection, but not stop. 65%	I don't care. 10%	Understandable 2%	
14. As a consumer, will you make the reputation of the corporate environmental responsibility of producing this commodity as a basis for choosing the goods?	I will do it every time. 7%	I will often do it. 38%	I will do it once in a while. 32%	I rarely do it. 20%	I never do it. 3%

Based on the above responses, the following results can be seen:

Question 1. From the response to question 1, we know that more than half of the investigated people have a deep understanding of the situation of environmental problems, and have an acute sense of the crisis of environmental problems, and understand the strategic policy connotation of the national environment.

Question 2. 97% investigated people agree that protecting the environment and saving resources is the top priority of human long-term survival and corporate sustainable development. This indicates that our social value is the environment and resources improvement.

Question 3. 95% investigated people care for the future generation, who is thought to enjoy the rights of natural resources and clean environment fair. This is our social attention, and also the reflection of what most people suffer from the current situation.

Question 4. 98% investigated people agree that it is imperative for the enterprises in our country to switch the extensive operation of resources to economical intensive management. So they know the root of current environmental problem

and support our national strategy.

Question 5. 98% investigated people support the recycling notion, which is believed to save the resources and protect the environment. Only when we are aware of the gap between the developed country and developing country, can we change our developing mode and maintain the sustainable development.

Question 6. The primary cause of environmental pollution and resource waste comes from the government, enterprises and social awareness. 46% investigated people hold the correct idea that enterprises have problems in its development purpose and technology promotion.

Question 7. 97% investigated people think the enterprise should take the responsibility for the environment. This is the important external pressure of corporate environmental responsibility.

Question 8. No investigated people disagree that Chinese enterprises only focus on economic interests and ignore their corporate environmental responsibilities currently. It shows that the self-interest development target is obvious, and it needs to pay more attention to the social benefit.

Question 9. 71% investigated people are not satisfied with the current performance of corporate environmental responsibility. When enterprises consider more about the health and living quality of the public, the result will be changed.

Question 10. 91% investigated people think taking environmental responsibility will help to improve corporate reputation. Corporate reputation is the internal force to increase the economic benefit of the enterprises. Now, it is high time to change their self-interest notion.

Question 11. 82% investigated people think that taking corporate environmental responsibility will not increase the cost, this is based on the long-run development perspective. And it will stimulate the enterprise to innovate to cut the cost and increase the benefit. This conforms with the sustainable development mode.

Question 12. Consumers' environmental consciousness (34%), public and investors' attention (33%), government environmental regulations improvement (27%) become the main reason that the enterprise can fulfill its environmental responsibilities. These stakeholders (especially the public) are important for the enterprises to make profit.

Question 13. 88% investigated people will oppose those who waste resources and pollute the environment in their work and life. But 65% will not stop it. The public sense of environmental responsibility remains to be strengthened. It also

indicates our current rules to support and protect the people need to be updated.

Question 14. 45% investigated people will frequently make the reputation of the corporate environmental responsibility of producing this commodity as a basis for choosing the goods. It means the consumers need more incentives to choose the environmental products. The corporate and enterprises can do more on it.

In short, the public have developed correct awareness about the current Chinese environmental situation and they are becoming the increasingly important pressure to urge the enterprises to take environmental responsibility.

4. SUMMARY

Currently, the environmental pollution disputes increase day by day, and have become one of the important factors that influence social harmony. From the perspective of SDS, the problem involves the 3 aspects of enterprise, government and the public. Investigation shows that the enterprise managers have deviation understanding of CSR, the local enterprises do not have mature CSR strategy and corresponding management system, and SMEs are lack of attention of environmental protection. In the wrong guidance of pure pursuit of economy interest by some local governments, the local protectionism becomes the umbrella and shield of environmental violations. Lack of law regulation and government failure to take environmental responsibility create convenience for the low rate of energy utilization, poor electronic waste management, *etc*. The public participation in environmental protection ability is week, city residents' energy conservation behavior is generally insufficient and rural residents' awareness of environmental problems severity is lower. Until recently the public has become an important pressure to promote CER. These factors also lead to the vacuum of supervision and support power. Only with the awareness of responsibility, and by the implementation of responsibility, can China's environmental pollution problems be solved step by step.

REFERENCES

Boaxia, Z. (1995). More Punishment to Control the Acid Rain. China Daily.

Chinese Academy of Engineering. (2000). *On China's Sustainable Development Strategy of Water Resources Comprehensive Report.*

Feng, Z. (2004). *Introduction of Circular Economy* (pp. 18-20). Beijing: Renming Press.

Gui, Y., Fu, T. (2000). The City Water Supply Situation and Characteristics of China.

He, Zuoxiu, Wang, Yinan (2004). Special Attention: Attention to the Tertiary Industry 37 Energy Efficiency. Economic Daily, April 28th.

Hua, Y., Bo, X. (2005). China's Electronic Waste Recycling Processing Industrialization Problem and Countermeasure. *Sustainable Development Economics and Environment* (p. 346). Shanghai: Tongji University.

Hu, A. (2004). China in the World Economy: Domestic Policy Challenges.

Li, H. (2007). *Enterprises Fulfilling Social Responsibility is Firstly to Enhance the Image. Why They Do Not Fulfill Their Social Responsibilities.* Enterprise Management Research.

Ma, X., Ortolano, L. (2000). *China Environmental Regulations: System.* Implementation and Compliance.

Ming, Su, Liu, Junming (2008). China's Environmental Protection Investment Insufficient Reason Analysis. China Economic Times, July 18th.

National Environmental. *Qual. Rep,* 1991-1995. [NEPA.].

Shan, Z. (2007). *Report on Corporate Social Responsibility in China 2006* (pp. 15-18). Beijing: Economic Science Press.

Shao, J. (2007). *Small and Medium-sized Enterprises Clusters and Economic Development.* Beijing: Science Press.

Tao, H., Li, L., Tian, C. (2005). *The German Environmental Administration System and Its Enlightenment. China Environment Yearbook 2005.* Beijing: China Environment Yearbook Press.

Wang, L., Zhang, Q. (2005). Discussion on the Administrative Division Impact on the Environment. *Conference Proceeding of Fudan University Environmental Economy Research Center the Sixth Annual Meeting and Symposium*Fudan Environmental Economy Research Center.

World Bank. (2001). *China: Air, Land and Water: the New Millennium Environmental Priority*.

Xian, G. (1999). *Foreign Direct Investment and the Environmental Interaction: the Case of China*.

Yang, Zhaofei (2006). Many Environmental Legislations with Seven Deficiency. Legal Daily, July 13th.

Ye, Z. (2012). *Corporate Resources and Environmental Responsibility and Sustainable Development, Business Ethics and Social Responsibility.* Beijing: China's Renming University Press.

Yin, G., Yu, Z., Wu, F. (2005). *Report on Corporate Social Responsibility in China.* China Corporate Social Responsibility Development Center.

CHAPTER 8

Empirical Research: Systematic and Scientific Analysis of Corporate Environmental Responsibility

Abstract: "System Of Systematic Methodology" (SOSM) requires that system practitioners not only check the problem situation from many different angels, but also integrate different systematic methodologies. It respects the strengths of various schools of system thinking and encourages different methods. For the complex system of CER, it can be improved through rigorous methods of system science to solve the current problem. The long-standing smog has seriously affected the daily life and public health, and has attracted wide attention from the whole society. It is an urgent problem that needs to be tackled with. In order to understand the actual situation of CER awareness and implementation, and to provide reference for the key indicators of CER construction, an empirical study on 30 Chinese heterogeneous enterprises is carried out. Based on the views and methodologies of SDS and learning from SOSM, this chapter combines the qualitative analysis and quantitative research and strives to achieve the research objective. By principle component analysis, the main factors of corporate environmental responsibility (CER) are found out: 1. Consumer satisfaction; 2. Investor satisfaction; 3. The frequency of environmental reporting to investors; 4. The importance of CER; 5. The status of CER in corporate social responsibility; 6. The government's regulation of the enterprise environment; 7. Corporate correspondence to environmental protection laws and regulations; 8. The clear internal environmental management work resources, responsibilities and authority. This result is of significance to guide the key work of enterprise environmental management. Additionally, by cluster analysis, the 30 companies are classified into three main sets and got different CER assessment.

Keywords: Corporate environmental responsibility (CER), Empirical analysis, Investigation, Principle component analysis, Systematic and scientific analysis.

From Chapter 1 to Chapter 6, the qualitative research has been established in CER study. According to the quantitative systems thinking, the nature of things can be understood in a more in-depth way, only after the quantitative study is accurately made (Wu, 2003). The critical systems thinking and comprehensive system intervention method provide the more sophisticated theories and methods for SDS. And it further promotes the empirical analysis of this chapter. Through the

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empirical study of 30 heterogeneous enterprises CER, we can understand the clustering CER and identify the 9 principle factors and key indicators of it.

1. THE THINKING OF SYSTEMATIC SCIENCE

In 1980s and 1990s, Critical System Thinking (CST) launched a broader picture to the world: system thinking, an interdisciplinary, became mature; a lot of steps, methods and models appeared and effectively operated in the complex organizational and social situation. In 1991, Vlad and Jackson published the book "Creative Problem Solving Method—Comprehensive and Systematic Invention". It provided new methods for planning, designing, problem solving and evaluating: Comprehensive and Systematic Invention (CSI). CST and CSI originated from critical consciousness, pluralism and the liberating style of system thinking (Michael, 2005).

In the 1980s, the informed criticism standard of individual systems increased. Jackson (1991) pointed out that all the system methodology has some strengths and also some weaknesses. The emergence of pluralism in 1984 brought inspiration to CST. The two results of "Multiple Perspectives for Decision Making" by Linston and the "System Of Systematic Methodology" (SOSM) by Jackson and Keith marked the birth of a more advanced form of pluralism (Jackson, 2005). It requires that the system practitioners not only check the problem situation from many different angels, but also integrate different systematic methodology. According to Linston, technology, organization or social and personal perspective take the role of filters to examine the system; each perspective thinks that when there are obvious differences between each other, the advantage of integration with each other to solve the problem is stressed and the effect of using will be prominent. Jackson and Keith's goal is to explore the guide to deal with problems and understand the strengths and limitations of different systems. SOSM shows that different systems can be regarded as complementary rather than competing with each other. Each system is useful for some purpose and a particular type of problem situations. Therefore, the diversity of methods is the growing ability in a variety of problem situations. SOSM provides an excellent opportunity for the future progress of system science. It respects the strengths of various schools of system thinking and encourages different methods advocates—previously they battled with each other—mutual respect; The emergence of "liberating style of system thinking" is a bit like filling a blank in the "periodic table" (*i.e*. SOSM), it is able to provide action-oriented approach in a number of mandatory context, while other systems thinking can not do it (Ulrich, 1983). Its role is to provide criticism to promote working process and methodology necessary to open and free discussion.

Thus, the complementary view on the theoretical level provides the basis and legitimate reasons for the complementary view on the methodology. In other words, CST can be complementary with SDS, thus the combination force will lead to the trend of overall system optimization, which is the main law revealed by SDS.

2. METHODS OF SYSTEM SCIENCE

System science has long been committed to achieve the target by providing methodology for system design. System science approach enables managers to act responsibly and their organizations will also benefit.

In the first edition of Systematic Analysis Manual, Quaid and Maize pointed out that many factors in the system showed regular behavior and scientific detailed observation has achieved a great deal of knowledge of these regulations. Therefore, many problems in the system can be dealt with by means of appropriate focus of the knowledge from the modern science logic, quantitative and structural tools. The central purpose of system analysis is to help decision makers and policy-makers analyze and solve problems. In particular, it proposed for the problem mitigation of possible actions. And it achieved the target by improving the judgement basis through producing information and presenting evidence (Quade, 1985). According to Hall from the Bell Telephone Laboratories, the system has hierarchy, and through designation, it can achieve the target in the optimal way (Keys, 1991).

In essence, the task of system approach is to find how to achieve the desired objective most effectively. For the complex system issue of CER, it can be improved through rigorous methods of system science.

3. CURRENT ENVIRONMENTAL SITUATION

Global energy and environmental crises push up the green barriers in international competition all over the world. In June 30, 2015, China submitted Intended Nationally Determined Contributions, which clearly states that China's carbon dioxide emissions will reach the peak around 2030 and strive to reach the peak as soon as possible, unit emission of carbon dioxide will fall 60%-65% compared to 2005 and non-fossil energy will account for 20% of primary energy consumption. Due to the largest amount of carbon emissions around the world, China is under great pressure to reduce carbon dioxide emissions and to save energy.[1]

Green development will become a trend in China. Our country puts forward the Five-in-One-Unity development concept of "innovation, coordination, green, open and sharing" and the overall requirements of ecological civilization construction, making the demand for green development in industry become more

obvious. "The plan of making in China 2025"1 clearly states industrial green development as an important pivot of building a strong power in manufacturing and puts forward an index system of green development covering energy intensity, carbon intensity, water intensity, comprehensive utilization of solid waste and other aspects, which provides a new angel for the study of this thesis.

Nowadays, the growing problem of smog has caused widespread concern. According to China's environmental monitoring report, three large-scale regional smog pollution processes have occurred in the past month, a total of 155 days of heavy pollution and 31 days of serious pollution have attacked 161 cities. Environmental improvement is imminent. Only by green development that avoiding environmental overdraft is possible. Smog is mainly caused by those enterprises, which ignore the environmental protection. Enterprise development is the main force of social progress. Corporations should take the responsibility of environmental improvement while in economic construction.

Enterprises assume environmental responsibility, which can not only improve the quality of green products, but also improve social environment. Nowadays, enterprises often take the responsibility of environmental improvement only after good development. They destroy the environment to develop economy at the early stage, which leads to an outcome that they have to pay more cost to improve environment. Even worse, many environmental phenomena are irreversible, thus causing great damage to the environment. Therefore, strengthening the environmental responsibility of enterprises will make the responsibility awareness root into enterprises, while driving more enterprises to take responsibility to alleviate the smog phenomenon.

4. THE EMPIRICAL ANALYSIS OF CORPORATE ENVIRONMENTAL RESPONSIBILITY

4.1. The Investigation Briefing

We surveyed 30 large and medium-sized companies and enterprises from August 2016 to November, including Jiangnan Shipbuilding (Group) Co., Ltd., Shanghai Huafu Restaurant Management Co., Ltd., Guangxi Nanning City Desert Coffee (Franchise Chain Co., Ltd.), we make a specific list in Table **8.1**. We conducted a questionnaire survey and received 56 questionnaires, including 50 valid questionnaires. The surveyed companies include the main business, raw materials, manufacturing, catering, information technology and insurance companies. Those include both traditional manufacturing and many service industries that are not directly involved in production activities, from which we understand the commitment and performance of more non-production enterprises to the company's environmental responsibilities.

Table 8.1. List of Corporations Surveyed.

Corporation Number	Name of Corporation
1	Dongtai Inland Revenue Department
2	Shanghai Ingersoll Rand Investment Co.,Ltd.
3	Ningbo Boway Alloy Material Co.,Ltd.
4	Shanghai ZTO Express Co.,Ltd.
5	Jiangnan Shipbuilding Group Co.,Ltd.
6	Shanghai MuTong Information Technology Co.,Ltd.
7	Hunan YongQing Investment Group Co.,Ltd.
8	China Security & Fire Co.,Ltd.
9	Shanghai HuaHuo Catering Management Co.,Ltd.
10	Shanghai YuLan Business Co.,Ltd.
11	Shanghai QingTing Information Technology Co.,Ltd.
12	Shanghai PinZhu Information Technology Co.,Ltd.
13	Shanghai Baoshan District Television Station
14	Suzhou WeiShi Environment Technology Engineering Co.,Ltd.
15	Shanghai Installation Engineering Group Co.,Ltd.
16	Shanghai Sainteen Casting Workshop Co.,Ltd.
17	Shanghai DiPeng Business Co.,Ltd.
18	Shanghai ChunWei Business Consultant Co.,Ltd.
19	Shanghai ASE Package Testing Co.,Ltd.
20	Nanning XiMu coffee Co.,Ltd.
21	General Electric Company Shanghai Branch
22	Shanghai Institute Of Technic Physical Of The Chinese Academic Of Science
23	Saic Motor Group Co.,Ltd.
24	AB InBev Beer Co.,Ltd.
25	Shanghai KaiYingDa Chemical Engineering Design & Consultant Co.,Ltd.
26	Shanghai ShunJia Video Management Co.,Ltd.
27	Shanghai Electric Factory
28	Ping An Insurance Group Co. of China Ltd.
29	Shanghai SONGZ Automobile Air Conditioning Co.,Ltd.
30	Shanghai SiLong Scientific Instruments Co.,Ltd.

The companies' geographical locations are mainly concentrated in the Shanghai area and the other small part of the distributions in Zhejiang, Jiangsu, Jiangxi,

Guangdong, Guangxi, Hunan and other regions. 57% of the employees who fill the questionnaire are grass-roots employees, 35% are middle and high-level employees and 8% are part-time and other employees. At the grassroots level, the employees will be less concerned about the concerns and pressures of the middle and high levels. High-level respondents can be more sensitive to the feeling and understanding of the company's environmental policy formulation, for the enterprise's environmental responsibility to bear a more direct and critical impact. In order to facilitate the accurate completion of the respondents, the questionnaire was designed for the company in a problem or on the action in accordance with the 1,2,3,4,5 incremental option to assess the entire questionnaire by the 40 questions. These problems are divided into A, B, C, D four groups. A class issues (A1-A4) are mainly about the government and the relationship between the enterprise and the interaction to design, including the government's environmental supervision for the enterprise, the effectiveness of the measures, the implementation of the enterprise and the business for the government to develop environmental policy participation analysis. Class B issues (B1-B9) mainly assess the company's investors, consumers, suppliers, business partners and peers for the company's environmental responsibility in the degree of attention, mainly reflecting in each other on the other side of the environmental requirements. Class C (C1-C23) mainly refers to the ISO14000 standard assessing the internal environmental management of the company. The items are designed in detail. The basic reference is made to the whole process of the whole work. Those problems are from the reference standards, laws and regulations to the specific work of the operation control, monitoring measurement, prevention mechanisms, and then to the audit release, the specific measures to prevent pollution and the extent of annual emissions are involved. They have very comprehensive assessment of the company's specific environmental measures and the situations to the extent. Class B questions (D1-D5) refer to the views and attitudes of the respondents on the above-mentioned measures of the company, which are important for us to understand whether they have sufficient awareness of environmental responsibility and to derive the company's environmental measures for their consciousness and the attitude caused by changes. These four categories of indicators are closely related to stakeholders, especially in the C category which is extensively involved in all stakeholders. In the view of the smog and other air pollution problems in recent years, the questionnaire emphasizes the air pollution and emissions of targeted attention. At the end of the questionnaire, there are questions about the degree of understanding of corporate social responsibility, and their views on the difficulties encountered by enterprises in implementing environmental responsibility. Those are important for corporate to understand the extent to which CER have taken.

4.2. Principal Component Analysis

The core notion of principal component analysis (PCA) is reducing dimension. Doing linear combination, we convert original variables into a series of linear independent and variance descending new variables which are called principal components. Obviously, original variables have inner correlation. With Pearson Correlation Analysis method, it turns out that the 40 variables in the questionnaire designation relates positively to each other. Owing to the space limit, Table **8.2** gets part of the relativity analysis result.

Table 8.2. Partial Results of Variables Relativity Analysis.

VAR	1	2	3	4	5	6	7	8	9	10
1	1	0.8323188	0.6024871	0.4923377	0.6541626	0.7164784	0.5909659	0.4157464	0.617117	0.5195498
2	0.8323188	1	0.7385728	0.6295535	0.7036563	0.8143393	0.6298451	0.454311	0.672574	0.5716553
3	0.6024871	0.7385728	1	0.4255854	0.4882557	0.6707292	0.4967583	0.2300577	0.4826976	0.5721781
4	0.4923377	0.6295535	0.4255854	1	0.4382691	0.3940188	0.2851529	0.3419795	0.4357775	0.3637877
5	0.6541626	0.7036563	0.4882557	0.4382691	1	0.8760302	0.7489001	0.7954223	0.8858828	0.7409153
6	0.7164784	0.8143393	0.6707292	0.3940188	0.8760302	1	0.8426986	0.6489991	0.8340721	0.7642853
7	0.5909659	0.6298451	0.4967583	0.2851529	0.7489001	0.8426986	1	0.6480267	0.7914954	0.6810299
8	0.4157464	0.454311	0.2300577	0.3419795	0.7954223	0.6489991	0.6480267	1	0.8599744	0.7547518
9	0.617117	0.672574	0.4826976	0.4357775	0.8858828	0.8340721	0.7914954	0.8599744	1	0.8625051
10	0.5195498	0.5716553	0.5721781	0.3637877	0.7409153	0.7642853	0.6810299	0.7547518	0.8625051	1

** Correlation is significant at the 0.01 level (1-tailed)
* Correlation is significant at the 0.05 level (1-tailed)

Now, by Matlab 2016 a software, the overlapped sections of original variables are withdrawn and synthesized. We do a pretreatment for the matrix which consists of original variables, in order to making every column vector standardization. The result is a level that each column's sum value is zero meanwhile its variance is one.

Table **3** shows the result of principal component analysis. We rearrange the Eigenvalues from high to low, and the Eigenvectors corresponding to those Eigenvalues respectively are called principal components (PCs). According to the basic principles of principal component analysis (PCA), the number of principal components can be determined by the accumulated contribution rate of variance (ACRV). Usually the standard is set when $\alpha \geq 0.85$. For the q selected principal components. If the ACRV amounts to 85%, or $\alpha \geq 0.85$, the number of the principal components can be identified as q. It indicates that the selected q principal components retain approximate 85% information of the 40 original variables. As shown in Table **8.3**, the α of the former 7 principal components is 87.407% (due to the ACRV of the former 6 principal components exceed 85% slightly, we

decide to select the former 7 principal components finally, for the purpose of acquiring a more accurate result). It means that the former 7 principal components retain most information of the original 40 variables. Consequently, the number of the principal components is 7.

Table 8.3. Principal Component Analysis.

Eigenvalue	CRV	ACRV	Number	Weigh In Selected PC
25.94520456	0.648630114	0.648630114	1	0.762847268
2.0589182	0.051472955	0.700103069	2	0.060536818
1.930963944	0.048274099	0.748377168	3	0.056774675
1.608109965	0.040202749	0.788579917	4	0.047282044
1.396153041	0.034903826	0.823483743	5	0.041050034
1.071658343	0.026791459	0.850275201	6	0.031509161
0.951856292	0.023796407	0.874071609	7	1

According to the explanation that 7 factors provide for the original 40 variables, they may be named as factor 1, factor 2, factor 3 and factor 9 due to the ranking of Eigenvalue. From Fig. (**8.1**), the sorting importance of 7 factors can be found out as the Scree Plot shows.

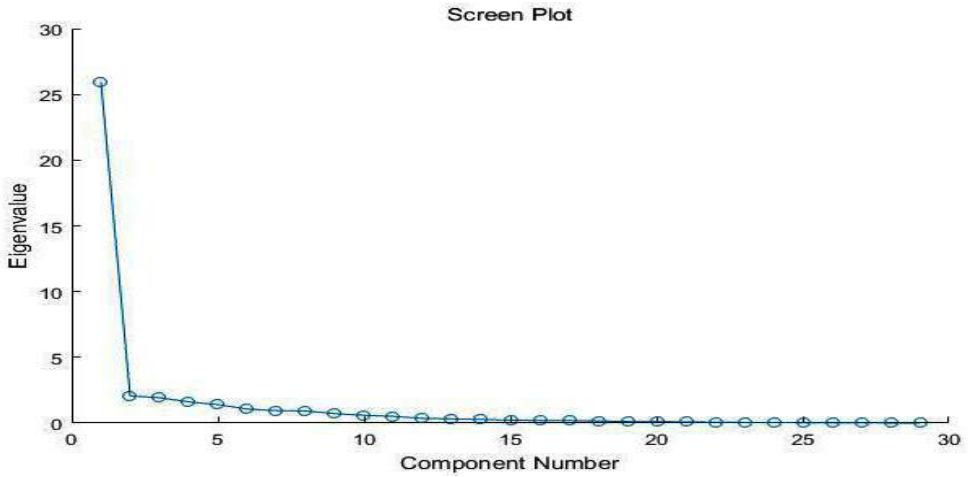


Fig. (8.1). Screen Plot of PCs.

Distinctly, factor 1 has the highest Eigenvalue (numble1 represent factor 1 in Table **3** and so on). Therefore, it has the highest contribution to the information of original variables. In addition, as Table **3** manifest, we find out the Eigenvalue of each factor has a big divergence. The ACRV's proportion of factor 1 attain 0.742,

and then the number of factor 2 is 0.059, factor 3 is 0.055, their aggregation reach 85.620%. It reflects the former three key principal components have the most information of original variables. We shrink the range of our study to these three factors and discern which group of variables has the most profound impact to our subject, corporation environmental responsibility. Based on Table **8.1**, Table **8.2** and Fig. (**8.1**), Table **8.4** shows the absolute value of the load factor of original variables on the former three principal components, and we rank them from low to high.

Table 8.4. The Absolute Load Factors Sorting of Original Variables on The Former 3 PCs.

		First PC			**Second PC**			**Third PC**
Weigh Sorting	VAR	25.94520456	Weigh Sorting	VAR	2.0589182	Weigh Sorting	VAR	1.930963944
1	34	0.04791833	1	29	-0.301782256	1	8	-0.259048553
2	40	0.069194601	2	27	-0.236460177	2	9	-0.217762848
3	4	0.108083758	3	14	-0.196923396	3	5	-0.21072253
4	17	0.119641566	4	3	-0.174457605	4	11	-0.191775087
5	12	0.128029273	5	26	-0.163185263	5	7	-0.182341496
6	3	0.135617641	6	24	-0.15152562	6	21	-0.163197556
7	39	0.140608675	7	13	-0.14820552	7	25	-0.124717509
8	8	0.141515219	8	31	-0.13459141	8	24	-0.123417976
9	13	0.142319687	9	28	-0.132301114	9	23	-0.107233773
10	1	0.145600151	10	22	-0.129110968	10	10	-0.10648724
11	33	0.146413493	11	33	-0.103509235	11	30	-0.092688927
12	7	0.146559191	12	20	-0.099267356	12	35	-0.085279978
13	16	0.153401291	13	23	-0.093390191	13	32	-0.084681473
14	21	0.153656933	14	18	-0.091943867	14	28	-0.079465472
15	36	0.155976936	15	4	-0.056983213	15	33	-0.072743882
16	35	0.156870553	16	19	-0.0532719	16	26	-0.02154411
17	2	0.157395391	17	25	-0.050698649	17	6	-0.013964752
18	15	0.157637048	18	21	-0.03563968	18	20	-0.007760161
19	14	0.161934629	19	37	-0.011760458	19	22	0.002397608
20	11	0.163900607	20	30	0.000182743	20	15	0.003226777
21	32	0.164404836	21	17	0.003167482	21	12	0.009126249
22	23	0.167780934	22	11	0.013923641	22	13	0.035203754
23	5	0.167886238	23	2	0.022288473	23	31	0.042526492

(Table 8.4) contd.....

		First PC			Second PC			Third PC
24	29	0.1687867	24	39	0.032128866	24	19	0.047190328
25	31	0.169016273	25	10	0.034469409	25	16	0.049599887
26	10	0.16927928	26	36	0.052488541	26	14	0.055464958
27	38	0.170368692	27	5	0.067815957	27	29	0.061247685
28	9	0.171476499	28	38	0.107186989	28	18	0.068508204
29	37	0.172030695	29	6	0.116138933	29	27	0.079159973
30	27	0.173112261	30	9	0.127098557	30	4	0.085732949
31	6	0.173124761	31	8	0.142859987	31	38	0.102366255
32	22	0.17534796	32	1	0.159185746	32	36	0.111698572
33	24	0.175441299	33	32	0.175721948	33	37	0.135414552
34	18	0.176283116	34	7	0.177733244	34	1	0.138192065
35	19	0.179162748	35	40	0.198344224	35	2	0.16581356
36	26	0.180403964	36	35	0.205016029	36	34	0.207428422
37	28	0.183030154	37	34	0.247775026	37	17	0.283430809
38	20	0.183354257	38	16	0.296319615	38	39	0.306781977
39	30	0.183730426	39	15	0.305761196	39	3	0.308639383
40	25	0.184434605	40	12	0.358423479	40	40	0.470994048

Through Table **8.4**, we find the load factors are ranked as a certain order. The larger the number of load factors, the closer relationship between the variable and the principal component it belongs to, it is to say the variable has more information than the others rank before. Observing the position of all original variables in Table **8.4**, we can acquire some of key indicators, as they play a vital role in corporation environment responsibility. In Table **8.5**, we display all the key indicators and their ranking of the load factors in three key factors.

Table 8.5. Key Indicators.

VAR	Illustration	Aggregation	Factor 1	Factor 2	Factor 3
38	A general increasing trend in consumers' satisfaction	86	27	28	31
37	An increasing trend in investors' satisfaction	81	29	19	33
6	The frequency of corporation's environment report sending to the investors	77	31	29	17
15	Corporation's attitude in undertaking environmental responsibility	77	18	39	20
40	The position of environmental responsibility in corporation's social responsibility	77	2	35	40

(Table 8.5) contd.....

VAR	Illustration	Aggregation	Factor 1	Factor 2	Factor 3
1	Governing impact on the design of corporation's environmental regulations	76	10	32	34
16	Corporation's performance in relative laws and statutes relating to protect environment	76	13	38	25
18	Resources, responsibility and authority in corporation's environmental management	76	34	14	28

4.3. Discussion

Based on the importance of the three factors and variable sorting, the above seven variables can be regarded as the key indicators of CER. And the order and explanation of them are shown as below.

4.3.1. Consumer Satisfaction will Promote CER.

Studies have shown that the developed countries' customers are more likely to prefer the high-quality products and the brand in the choice of goods. These features promote the growth trend of green, organic, fair trade and other corporate social awareness. Shrewd consumers are the driving force behind the company's social responsiveness. At the same time through the Internet corporate social awareness will be amplified and disseminated to attract the attention of the world's corporate behavior that will have a positive effect.

4.3.2. Investor Satisfaction will Promote the Implementation of CER.

Any company will drive CER in their supply chain up and down. So more and more people insist that companies should not only focus on their business, but also on their commitment to the CER. Investors and invested enterprises will continue to promote the commitment of CER in the "promoting responsibility" supply chain.

CER contributes to corporate financial performance, and public investors will invest the stocks that are positively affected by the environment or have a positive impact on the community, which will also encourage companies taking more corporate environmental responsibilities.

4.3.3. The Frequency of Environmental Reporting for Investors will Enhance the Transparency of CER.

The investor's understanding of the business is related to the frequency of the enterprise's environmental reporting. The more frequency of environmental reporting, the more positive attitude on investor's business practice will have.

Investors can understand the attitude and behavior of the companies from environmental reports and intentions *etc*. Those can greatly improve the business efficiency of the enterprises.

4.3.4. Enterprises Attach Importance to Environmental Responsibility.

If the corporations attach great importance to the CER, and the CER roots in the organizations in the form of culture, and the CER can show out during the interaction between staffs, the corporations will enable employees to have a strong sense of unity. Employees who are used to consider colleagues in the natural interests of employees - consumers, suppliers, investors, *etc*. are more responsible to corporations. And then the productivity and efficiency of the corporations will be greatly improved.

4.3.5. CER has an Important Position on Corporate Social Responsibility.

The bottom line of corporate social responsibility points out the corporate social responsibility contains the bottom line of the economy, environment and society, which means that corporations must fulfill the most basic economic responsibility, environmental responsibility and social responsibility. Today's economic responsibility is not the only element that defines the success of an enterprise, so companies should begin to agree with the concept of sustainable development. Today's environmental problems have become social problems that affect the survival and development of mankind. One of the sources of environmental problems lies in the unscientific use of environmental resources by corporations. And the solution also depends on the environmental protection measures of corporations.

4.3.6. Environmental Management Work Resources, Responsibilities and Authority should be Clear.

The enterprise should have a reasonable allocation of human resources, and determine the environmental management of the staff structure including environmental protection, the total responsible person, the relevant departments of the person in charge, and related contacts. At the same time, enterprises should strengthen the supervision of environmental management personnel responsibilities, clear division of labor, and complete efficiently the enterprise environmental responsibility required to submit the relevant materials which include the management manual and procedural documents (such as compliance evaluation control procedures, emergency plan management control procedures, Chemical management control procedures, the relevant party management control procedures, environmental factors identification, evaluation control procedures, energy resource management and control procedures, *etc*.); important

environmental factors to identify the evaluation form and its contingency plans (such as toxic gas leaks, fire incidents, *etc*.) ; In management review, internal audit report and related information and records; related laws and regulations list.

4.3.7. Corporations should Meet the Requirements of the Environmental Protection Laws and Regulations.

If business behaviors cannot meet the requirements of laws and regulations, then its legitimacy will be questioned by the stakeholders and its reputation and business will be also affected. On the contrary, companies strictly comply with laws and regulations, then the production of products will get consumers' satisfaction and corporate philosophy will be praised by other stakeholders.

4.3.8. Government should Strengthen the Intensity of Corporate Environmental Regulation.

The government has right to ask enterprises to hand regularly discloses, comply with laws and regulations and intervene the behavior of enterprises. The government can also encourage enterprises to take more CER by the encouraging standards such as preferential corporate social responsibility procurement, export guarantees, investment subsidies, tax credits, foreign aid and foreign direct investment, and pension disclosure standards. Those can encourage more enterprises to commit CER.

The above eight variables can be classified as enterprise system outside variables and enterprise system variables:

4.4. Enterprise System Analysis

As previously mentioned, enterprise is a system. Now let us make an analysis of CER in light of system external stakeholders and system internal stakeholders (see Fig. **8.2**).

4.4.1. System External Stakeholders

Consumer Satisfaction

Evidence shows CER will lead to sustained sales and loyal customer base. Consumers are the most important part of the consumer satisfaction and their improved satisfaction to enterprise products will promote enterprise development. Business commitment to environmental responsibility will allow consumers to feel the enterprise's contribution to the social environment, then consumers' satisfaction with the enterprises will rise, and it will bring further benefits to the enterprise. Therefore, CER is to enhance the consumer satisfaction with the

company in a good way.

Investors' Request

CER will enhance the reputation of enterprises. Expand the market share of enterprises and the wise investors will have a clear understanding for this trend, and ask some corresponding requirements of enterprises, which is undoubtedly to promote enterprise environmental management and achieve greater economic effective guarantee of efficiency. Investors should strengthen environmental awareness, improve the environmental responsibility of enterprises in the implementation of the requirements, urge enterprises to build environmental management system and stress enterprises to strengthen the enterprise employees on enterprise environmental management training.

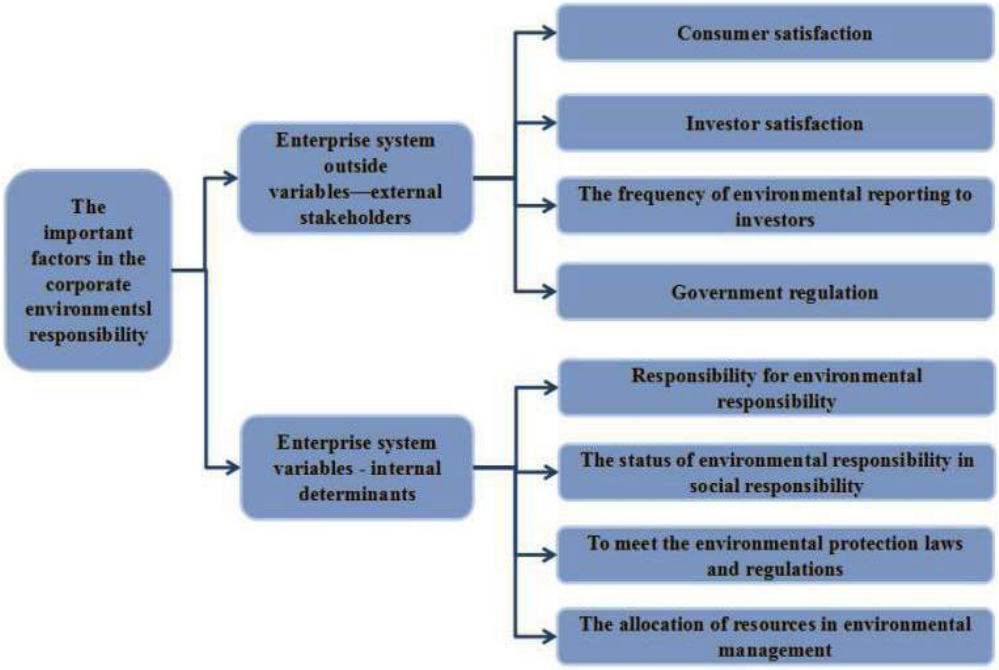


Fig. (8.2). The Important Factors in CER.

Corporate Environmental Information Report

The environmental information of the enterprise is very important to the external stakeholders. The enterprise should regularly disclose the results of the assessment of the enterprise environment (green products and services, energy and climate change, energy efficiency and environmental impact of the circular economy and other aspects), which is conducive to stakeholder awareness and

decision-making.

Government Regulation of Corporate Environment

Governments are as the powerful functional unit, so the CER should be included when making policies, provide CER to bear the rules, and establish assessment mechanisms. CER can not only bring economic benefits, but also can effectively improve the smog and other environmental issues, which will play an important role on the country's environmental governance. The government can take incentives, such as government green subsidies referring to the government directly or indirect pay tax relief to the corporations, and governments can achieve ecological goals of enterprises, obtain more benefits to promote environmental pollution improvement and control. Subsidies can even make subsidies to enterprises can implement more stringent management standards to increase their own competitiveness.

4.4.2. System Internal Determinants

The Importance of Business Leaders to CER

Enterprises' development is not just the accumulation of profits, because businesses are the part of society and the performance of business effects the development of society. From the developed countries in the process of economic development, we can see the expensive price dealing with the rapid development of corporations due to the early environmental damage. CER will reduce the cost of corporate governance environment, and CER will form a chain of positive effects, driving the investors, competitors and other stakeholders to bear it.

The Implementation of Environmental Laws and Regulations

Enterprises need funds to establish a special internal environmental supervision department, but funds are often the reason for not establishing or maintaining the internal environmental regulatory authorities. So to bear the responsibility of environmental responsibility at the lowest cost is to comply with environmental laws. Enterprises should not only bear their own environmental responsibility in the development of the process but also require investors and other stakeholders to play a supervisory role.

Resources, Responsibilities and Authority for Corporate Environmental Management

Establishing and improving the environmental management of a reasonable system, institutions and systems are the necessary of enterprise environmental

management. Organizations should ensure that enterprises should be a reasonable classification of human resources, clear the powers and responsibilities of various departments, build the establishment of unified management of production and environmental protection and unified inspection and evaluation system. In particular, the overall leader of the enterprise should be the person responsible for environmental protection and the leadership of the enterprise environmental management. Production person in charge should also be responsible for environmental protection business, other leaders should be responsible for their own business within the scope of environmental protection work, engineers responsible for environmental protection and technical work of the leadership, the functions of the Branch in its own business work in the infiltration of the relevant environmental protection work and the formation of an effective environmental management system.

4.5. Cluster Analysis

Besides selecting the key indicators, the results of principal component analysis(PCA) mark the 30 corporation based on their performance on 30 original variables (the higher grade means the more benign performance). The following table shows the grade of 30 corporations.

We find the number five corporation, Jiangnan Shipbuilding Group Co., Ltd., marks a highest score while the number twenty-five, Shanghai KaiYingDa Chemical Engineering Design & Consultant Co., Ltd., get the lowest score. It indicates the former one does a good job in corporation environment responsibility but the latter one has some weaknesses accordingly. Then, we reset the corporations' sorting by considering the score they get from high to low. We can set a numerical criterion to divide these corporations into different groups. For instance, we regard those corporations whose scores over 2 points as the first group where corporations in it have the most benign performance in CSE. While we classify the companies which get scores below -2 in the third group where corporations in it have deficient performances and the rest corporations belong to the second group.

Cluster analysis has various types and we choose one of them, its purpose is classifying the resemble company to a set. Based on previous works, we can count their Euclidean distance directly to divide them into different sets. Fig. (**8.3**) below shows the result.

We check the figure from right to left and imagine there exists a horizontal line which penetrates the figure. We stop at a position where this horizontal line intersects with five short vertical line, we then divide all 30 corporations into five subsets (that is to say, No. 6 and No. 25 belong to the first subset, No. 4 belongs

to the second subset and so on). However, if we regard the first three subsets as the first set (we can do this because these three subsets have a relative close relationship, furthermore the first two subsets have a small quantity of corporations), regard the forth subset as the second set, the fifth subset as the third set. We classify 30 corporations in three main sets.

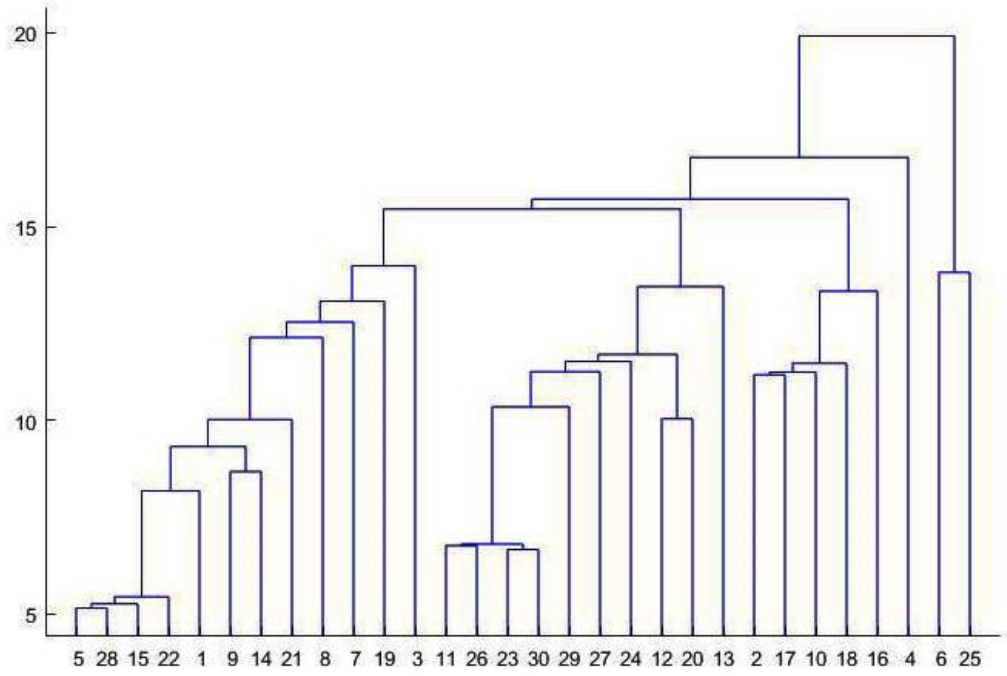


Fig. (8.3). Dendrogram of Cluster Analysis.

Table 8.6. Corporation Classifying By PCA.

Corporation Number	Name Of Corporation	Score	Score Reset	Corporation Number	Divide Into Three Classes
1	Dongtai Inland Revenue Department	3.739034492	4.691002605	5	1
2	Shanghai Ingersoll Rand Investment Co.,Ltd.	-4.084735415	4.518992822	22	1
3	Ningbo Boway Alloy Material Co.,Ltd.	1.547335974	4.415982649	28	1
4	Shanghai ZTO Express Co.,Ltd.	-3.062187975	4.265231515	15	1

(Table 8.6) contd.....

Corporation Number	Name Of Corporation	Score	Score Reset	Corporation Number	Divide Into Three Classes
5	Jiangnan Shipbuilding Group Co.,Ltd.	4.691002605	3.911246473	9	1
6	Shanghai MuTong Information Technology Co.,Ltd.	-5.35219781	3.739034492	1	1
7	Hunan YongQing Investment Group Co.,Ltd.	2.422343188	3.726687627	21	1
8	China Security & Fire Co.,Ltd.	2.556180178	3.390271214	14	1
9	Shanghai HuaHuo Catering Management Co.,Ltd.	3.911246473	2.556180178	8	1
10	Shanghai YuLan Business Co.,Ltd.	-3.746067726	2.422343188	7	1
11	Shanghai QingTing Information Technology Co.,Ltd.	-1.148807705	1.587731039	19	2
12	Shanghai PinZhu Information Technology Co.,Ltd.	0.115069509	1.547335974	3	2
13	Shanghai Baoshan District Television Station	-1.22964595	0.52347704	24	2
14	Suzhou WeiShi Environment Technology Engineering Co.,Ltd.	3.390271214	0.519388912	20	2
15	Shanghai Installation Engineering Group Co.,Ltd.	4.265231515	0.115069509	12	2
16	Shanghai Sainteen Casting Workshop Co.,Ltd.	-3.320237477	-0.586684237	23	2
17	Shanghai DiPeng Business Co.,Ltd.	-3.5204922	-0.781918411	27	2
18	Shanghai ChunWei Business Consultant Co.,Ltd.	-3.176693274	-1.136374916	30	2
19	Shanghai ASE Package Testing Co.,Ltd.	1.587731039	-1.148807705	11	2
20	Nanning XiMu coffee Co.,Ltd.	0.519388912	-1.22964595	13	2
21	General Electric Company Shanghai Branch	3.726687627	-1.549302655	26	2
22	Shanghai Institute Of Technic Physical Of The Chinese Academic Of Science	4.518992822	-2.174071823	29	3
23	Saic Motor Group Co.,Ltd.	-0.586684237	-3.062187975	4	3
24	AB InBev Beer Co.,Ltd.	0.52347704	-3.176693274	18	3

(Table 8.6) contd.....

Corporation Number	Name Of Corporation	Score	Score Reset	Corporation Number	Divide Into Three Classes
25	Shanghai KaiYingDa Chemical Engineering Design&Consultant Co.,Ltd.	-7.060557664	-3.320237477	16	3
26	Shanghai ShunJia Video Management Co.,Ltd.	-1.549302655	-3.5204922	17	3
27	Shanghai Electric Factory	-0.781918411	-3.746067726	10	3
28	Ping An Insurance Group Co. of China Ltd.	4.415982649	-4.084735415	2	3
29	Shanghai SONGZ Automobile Air Conditioning Co.,Ltd.	-2.174071823	-5.35219781	6	3
30	Shanghai SiLong Scientific Instruments Co.,Ltd.	-1.136374916	-7.060557664	25	3

Comparing the last column in Table **8.6** with the figure above, we find the results of CER's assessment of the 30 corporations by using the principal component analysis and cluster analysis are basically consensus (as long as we regard the corporations which scores over 1.5 as the first set, scores from -2.5 to 1.5 as the second set, scores below -2.5 as the third set, the classifications are totally the same). Thus, we can classify 30 corporations into three sets perfectly. The first set has first-class performance in CER, the second set falls behind the first set and the third set make a deficient performance. Finally, we achieve the classification of 30 corporations.

5. SUMMARY

This chapter focuses on the empirical study on the 30 heterogeneous enterprises in Shanghai. The aim is to understand the actual situation of CER awareness and implementation, and to provide reference for the key indicators of CER construction. Based on the views and methodologies of SDS and learning from the pluralism and methodology of system science emerged in 1980s, this chapter combines the qualitative analysis and quantitative research and strives to achieve the research objectives creatively. This chapter uses the system methods of factor analysis and cluster analysis, which is the effective complement to the methodology of SDS. It reflects the development law of difference coordination and integrity improvement and also provides the basis for the focus of corporate environmental management.

NOTES

[1] Shanghai Economic and Information Commission, The "13th-Five-Year-Plan" of Shanghai Industrial Green Development, March 9th, 2017.

REFERENCES

Dillon, P.S., Kurt Fishcher, K. (1992). *Environmental Management in Corporations: Methods and Motivations.* Medford, MA: Tufts University Certer for Environmental Management.

Greeno, J.L. (1994). Corporate Environmental Excellence and Stewardship.*Environmental Strategies Handbook: A Guide to Effective Policies and Practices* (pp. 43-64). New York: McGraw-Hill.

Jackson, M.C. (1991). *Systems Methodology for Management Sciences.* New York: Plenum. [http://dx.doi.org/10.1007/978-1-4899-2632-6]

Jie, W. (2003). *Systematic and Dialectical Science* (pp. 38-39). Beijing: Renming Press.

Keys, P. (1991). *Operational Research and Systems: The Systemic Nature of Operational Research.* New York: Plenum. [http://dx.doi.org/10.1007/978-1-4899-0667-0]

Lawrence, A.T., Morell, D. (1995). Leading-Edge Environmental Management: Motivation, Opportunity, Resources, and Processes. *Research in Corporate Social Performance and Policy,* (Suppl. 1), 99-127.

Micheal, C.J., Fei, G., Meng, L. (2005). *System Thinking—Creative and Integral Views for Managers*. Beijing: China Renming University Press, pp. 269

Quade, E.S., Miser, H.J. (1985). The Context, Nature and Use of System Analysis.*Handbook of Systems Analysis: Overviews of Uses, Procedures, Applications and Practice* (pp. 1-41). New York: North Holland.

Ulrich, W. (1983). *Critical Heuristics of Social Planning.* Bern: Haupt.

CHAPTER 9

Countermeasures: Recommendations of Improving the Corporate Environmental Responsibility

Abstract: It is the collaboration with the government and the public that corporate environmental responsibility can be improved. From the government perspective, regulation is of great importance. The extended producer responsibility policy, help with industrial structure upgrade and environmental e-government construction will be the effective measures; From the enterprise perspective, self-regulation is advocated. The implementation of ISO14001 system strategies and construction of environmental culture will enable the enterprises to reach the goal. Chinese senior managers need to change their minds, recognizing the importance to improve resource utilization, reduce environmental investment and increase business performance. To improve the environment is not an annoying burden, but a good opportunity to boost the economy and increase sustainable competitiveness. China's enterprise implementation of total environmental management strategy is a complex system engineering. It involves the entire product life cycle of product research and development design, manufacturing, sales, use, scrap processing and recycling. It also includes management strategy decision, market research, raw materials and spare parts supply and quality management; From the perspective of the public, green consumption, social services and non-government involvement will be the significant drivers. At present, as the product of "Internet +", the micro whistle blowing encourages the public to participate in environmental protection anytime and anywhere. They can use the APP to get the government public data, forward the information through the microblogging, and promote the environmental protection department to follow up and supervise the polluting enterprises actively, and make direct rectification. The innovative non-governmental operation model needs to be broadly implemented.

Keywords: Corporate environmental culture, Corporate environmental responsibility, Enterprise self-regulation, Government regulation, Non-government involvement, Policy, Public participation.

Based on the SDS perspective, we analyzed China's CER deficiency and the causes. It is recognized that Chinese CER is decided and controlled by the historical background and social factors. To put all the blame on the business can neither solve the problem completely, nor conforms to the law of social development. As the social organic composition, the government, public and

Wang Hong

NGO active participation will enable CER to operate effectively in the new system.

1. GOVERNMENT REGULATION

To improve CER, government departments should design some good systems, which should be based on the company development and also meet the operational rules in Chinese conditions. The systems should motivate enterprises to choose their own patterns of behavior and also regulate the enterprises operation. The target is to promote the win-win situation of economic and social benefits.

1.1. Extended Producer Responsibility Policy

Extended Producer Responsibility (EPR) Policy was firstly implemented in OECD countries an environmental policy. The policy encourages the producers to extend responsibility for the products to the waste disposal stage of the life cycle. The EPR policy of OECD countries is effective in the products (including the importing products) sold in these countries and the producers. As OECD countries are the main exporting market of Chinese business, some of them will certainly be affected by the policy. At the same time, China's environmental problems have become more and more salient, the environmental policy should be coordinated with the industrial policy. Though not implemented the EPR policy, China needs to learn from the experience of OECD countries, enabling producers to bear the waste disposal cost and reduce consumer waste emissions.

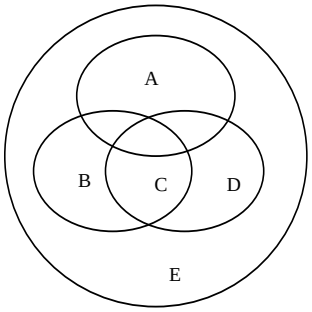
1.1.1. The Connotation of EPR Idea

The idea of EPR was firstly proposed by Sweden environmental economist Thomas Lindhquist in 1990. In his 1992 report submitted to Sweden Environment and Natural Resources Ministry, he defined EPR as follows: EPR is an environmental protection strategy, with the target to reduce the total environmental impact of products. It will achieve the target through manufacturer's responsibility for the whole life circle, in particular, at the stage of product recycling and final disposal (Lindhquist, 1998).

According to the EPR model of Lindquist (see Fig. **9.1**), producers' responsibility has the following 5 basic types (Lindhquist, 1998; OECD, 2001):

1. Product responsibility. That is, producers have the responsibility for the environmental or safe damage, which is proved to be caused by the product. Product responsibility exists in the product use stage, as well as in the product final disposal stage.

2. Economic responsibility (or financial responsibility). It means the whole or partial cost paid by the producer for the management of after use waste. It covers waste collection, classification and disposal.
3. Material responsibility. It is the direct or indirect product management responsibility after product use period (after consumption period).
4. Information responsibility. It means the responsibility to provide the information of the product and its impact in different life cycle of product, for example, environmental symbol, energy information or noise.
5. Ownership responsibility. In the whole life circle of product, the producer maintains the ownership of the product, which concerns its environmental impact.



Remarks:
A: Product Responsibility
B: Economic Responsibility
C: Ownership Responsibility
D: Material Responsibility
E: Information Responsibility

Fig. (9.1). EPR Mode (Source: OECD, 2001).

1.1.2. EPR Policy Implementation in OECD Countries

OECD defines EPR as an environmental policy, which calls for producers to extend product responsibility to the post-consumption stage in the product life cycle (OECD, 2001). EPR policy has two inter-connected characteristics: firstly, the responsibility for product waste disposal is wholly or partially transferred from the municipalities to the original producers; secondly, producers are promoted to take into account the environmental impacts in product design.

The EPR policy enables managers to take the economic responsibility of the discarded products. Previously, it is mainly undertook by the local government. Now it is internalized into the producers' cost. Thus, the producers, who strive for the maximized profit, are motivated to reduce the cost of product recycling disposal. Instead of ignoring the cost of recycling as they did in the past, they will consider the cost in the whole process, including the product design, manufacturing and recovering. The policy stimulates the producers to make products with minimized waste and develop economically effective product circular disposal system.

In 1991, the EPR policy implementation is originated in the German Packaging Ordinance. At that time, German faced serious inadequacy of rubbish landfill site. And the package materials waste was about 30% of the total weight of German urban waste, 50% of the total volume. At that time the German Environmental Minister Klaus Topfer solved the problem through empowering the enterprises be responsible for their own package material waste. Although there were a lot of problems, such as high cost of EPR policy implementation, initially in Germany, the implementation proved that the policy was successful. The using volume of German packaging material decreased significantly. Compared with 1991 when the Packaging Materials Law took effect, the packaging materials reduced 1.4 million tons in 1997 and 5.45 million tons of old packing material were reused in the same year.

Currently, most OECD countries implemented EPR policies for a vast variety of products, including electronic and electrical equipment, packaging materials, cars, tires, batteries, refrigerants, lubricants, paints and so on. EPR policy instruments include many different types of the two extremes from the completely mandatory to the voluntary. Many OECD countries adopted legal mechanisms to implement EPR policy. The European Union and Japan have executed or are ready to execute EPR policy (or law) on packaging and packaging waste, scraped cars and electronic equipment waste. The European Union has adhered to the Directive on Packaging and Packaging Waste, End of Life Vehicles (ELV) Directive and Waste Electrical and Electronic Equipment (WEEE) Directive; Japan has complied with the Container Packaging Reuse Law (CPRL) and Especial Household Appliances Recycling Laws (EHARL). And they are ready to apply the end-of-life vehicle recycling laws. The EPR policy announced by the Japanese Environment Ministry in 2001 has been detailed in Chapter 5. In America, some states have EPR legislation and some American companies have become conscientious models for the EPR policy implementation.

The in effect EPR policy and law generally require that consumers (or users) shall not get rid of any waste arbitrarily, they must classify them and even send them to the designated collection places; The producers must (partially or completely) take the responsibility for waste recycling and disposal, or entrust a third party to do it. The so-called producer is regarded as the owner of the product label or product importer (for foreign products) under normal circumstances. For the issue of packaging, the user, not the manufacturer of packaging materials, is considered to be the producer. So-called the third party is generally known as the Producer Responsibility Organization (PRO), which is a certain business or non-profit organization. They are accountable for the management of product recovery. Currently, most of the PRO directly charges the principal producer in terms of certain rate structures (Qian, 2004).

As described in Chapter 5, Xerox began to use recycled products in 1991, and they integrated the used parts into new products. After 1993, the international EPR implementation trend motivated the company to put forward the target of "not producing waste products in the factories with zero waste". The company has made many efforts in product design, products recycling, related raw materials recycling. It is known as the asset recovery management of the company. Xerox's unique mode of equipment leasing operation provides a ready and effective pathway for end-of-life product recycling. In Xerox equipment products (copiers, printers and fax machines), only 25% is sold with no return, while the remaining 75% is leased out. Equipment leasing is done by the subordinates of Xerox—Xerox Business Center and Xerox Trust Company. Xerox provides a full range of maintenance services for all rental equipment. In addition, Xerox equipment recovery is completed by company's 50 core logistics centers in the United States. Recycling equipment in the transport logistics center directly uses the return journey of the product delivery transport. The recycling equipment from the core logistics center are collected together and transferred to the company's distribution center in Cincinnati, and finally distributed to the company's products recycling base in New York and Mexico. One important task of Xerox Asset Management is to set up a product design team, consisting of asset recovery engineers, product designers and environmental experts to develop new products. Xerox has made the following improvements: reducing the use of hazardous materials, increasing the versatility of different product components, decreasing the amount of product components, equipping the product components with material composition or related information (such as making marks on materials and installing automatic records), improving parts structure for the convenience to be disassembled. As Fig. (**9.2**) shows, after the product recycling implementation, Xerox logistics system not only undertakes the original sales logistics, but also commits to the new collection logistics, and there is little increase of the company cost.

1.1.3. Suggestions for China's EPR Implementation

OECD countries are the major export markets for Chinese companies, which may be subject to the discrimination of local monopoly producer responsibility organizations (including the definition of waste recovery of price and quantity), especially when the composition of the product packaging materials are different from the host country enterprises. At the same time, the competitors of Chinese electrical appliances, electronic equipment manufacturing enterprises are the large enterprises whose business cover both commodity production and sales recovery. Thus the market entry barriers become higher for Chinese enterprises. They must become the same type of multinational companies to survive in the competition. In order to keep balance between environmental target and economic efficiency,

the EPR policy design, which is also suitable to China, should pay attention to the following points.

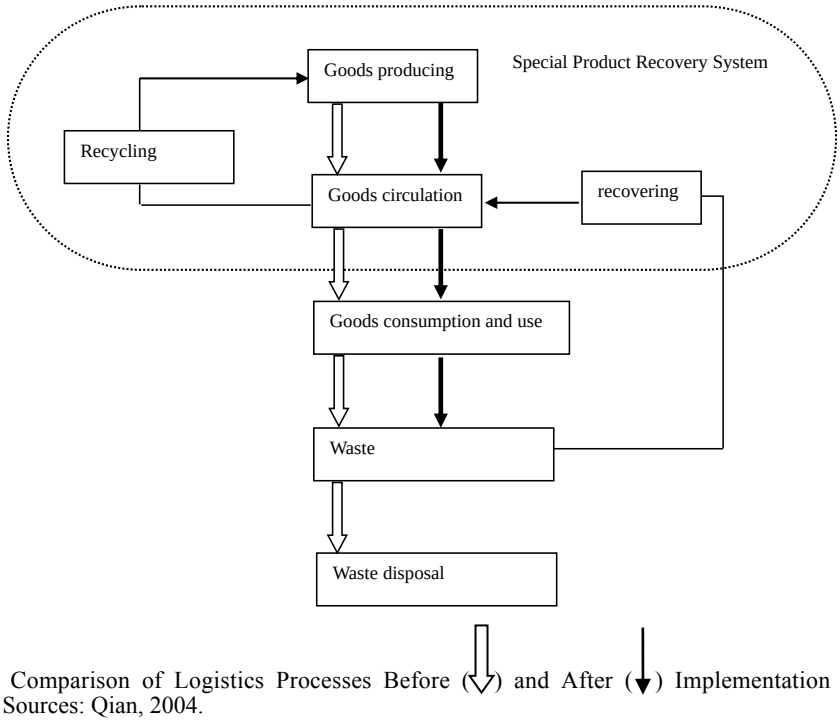


Fig. (9.2). Comparison of Logistics Processes Before (⇩) and After (↓) Implementation of Product Recycling. Sources: Qian, 2004.

The first point is to choose the implementation object. In determining whether the product is suitable for EPR implementation, the factors such as the product life, structure, market, distribution and secondary materials markets will be taken into consideration. From the implementation experience of OECD countries, the more successful use of EPR policy includes these types of products: carpets, paint, tires, batteries, waste oil, scrap cars, packaging waste, waste electrical and electronic equipment, and so on. Generally, the value of product recovery and environmental impact of waste are the main factors to decide whether to use EPR policy. Those products with higher recovery value and lower environmental impact can spontaneously form a market-oriented recycling system. In contrast, those waste products with high environmental impact, rapid growth of production, deficient recycling commercial potential and in need of government policy intervention will be removed from the first EPR policy choice.

The second point is the design operation mode. Firstly, the various roles in the product chain must be clearly defined, so that the producers, sellers, consumers and recyclers will be sure of their tasks. In view that the producers in the entire product chain is to promote the product design and update the key part of waste

reduction, and producers can also affect the raw material suppliers, consumers, government, media and sellers to fulfill their respective responsibilities. So the correct definition of producers is the key to ensure effective implementation of EPR policy. For different types of products, the connotation of producers will be different. For example, the long-life products, for example, the household appliances, IT products, the trademark holders or importers are usually defined as producer; General manufacturers of products for the lack of clear trademarks are often identified as producers; For the packaging, usually the user of packaging rather than the manufacturer is defined as a producer.

The specific operation mode design determines the recycling method of waste sharing responsibility, which contains both economic responsibility and actual operation responsibility. The typical pattern is: the consumer is responsible for waste products and other waste separation delivery; the local government is responsible for the separate items collection work; and the producers pay all or part of the recovery cost and responsible for final recycling. The other mode is the cooperation mode between producers and sellers or renewable companies. According to the specific policy tools, products and supply chain factors, different burden-sharing methods can be formed. For example, the sellers use the way of deposit refund to deal with the waste recycling or the consumers buy the post handling charges. This is widely used in the recycling of waste electrical and electronic equipment. The producer's recycling waste through the regeneration company pertains to this type of mode.

The third point is to prescribe payment method. Although the cost of recycling waste will eventually be reflected in the price of product, there are different modes of payment, when it comes to the specific payment of recovery cost. This will influence the ultimate financial cost on producers and consumers. One is the pre-paid model. That is, the recovery cost has been pre-attached to the product price when consumers buy products. Another is the model of payment at discarding. That is, consumers have to pay when they decide to discard the product.

The greatest advantage of pre-paid model is easy to manage. However, for the longer life product, fluctuations in the prices of natural resources, the future recovery cost may change a lot, due to the technological innovation. At the same time, concerning the actual recovery rate, the number of actual recovery by the producers may be considerably lower than the number of sales. And this will bring the additional economic burden to consumers. Comparatively, payment at discarding is fair to consumers. It can motivate consumers to extend the life of the product and reduce the number of discarded products. Nevertheless, the biggest disadvantage of this model is the problem of illegal dumping, which will greatly

increase the management cost.

The fourth point is to determine the specific indicators of implementation. In the successful implementation projects, the specific recycling indicators are clearly brought forward. The indicators determination has an important impact on the operation cost of the recycling system as a whole. The EU's Waste Electrical and Electronic Equipment Instruction defined per capita 4kg indicators before 2006. At the same time, the instruction also stipulated the recycling indicators (65%—75%), including ten categories of electrical and electronic products. According to the current EU e-waste generation estimation, the overall recycling target and the whole recycling target are lower, and the number of appliance sold will be set recycling targets as the benchmark after 2008.

To set up reasonable and feasible targets requires in-depth study, whether it is voluntary or mandatory targets. And the formulation process requires a comprehensive analysis of various factors, such as the relevant interests of all involving parties, especially producer. The demand and capacity of regeneration market, the regulatory operability are the factors to be considered. Currently, the more feasible way is to introduce the target stages and gradually turn to strengthening.

The fifth point is to give full play to the mission of Producer Responsibility Organization (PRO). In the specific implementation process, apart from the major role of producers, sellers and consumers, there is a very important third party group—PRO. The organization plays a decisive role in the success of EPR policy implementation, especially for small and medium enterprises. They can greatly reduce the difficulty and cost of fulfilling the duties through participation in the organization. At the same time, the organization plays an important role in linking the other interest groups and regulators (Zhang and Liu, 2005).

The sixth point is about the transnational business operation. Multinational enterprises have played a positive role in facilitating global integration, solving surplus labor in developing countries and promoting the comprehensive national strength of the host countries. At the same time of expanding their global market, the transnational enterprises seized more excellent talent, capital, material and other social resources. So it can not be ignored that they have obtained more profits than in their home countries (Liu, 2005). In the globalization management, multinational enterprises brought the host countries unfavorable outcomes, especially the environmental pollution, resulting in the production cost externalization. Therefore, all the laws, including EPR law, which are suitable for Chinese enterprises, should also be applied to transnational business operation. This is the important aspects of Chinese government environment legislation.

1.2. Industrial Structure Adjustment

At the turning point of the century, the serious water pollution of Suzhou River led to the mortified situation, that is "people who live in the riverside have no water to drink". Suzhou River is the birthplace of modern Chinese industry. Its cross-strait industrial development and changing industrial structure manifests not only the historical context of Shanghai industrial development, but also the national industrial development,especially since the founding of New People's Republic of China (Li, *et al.*, 2007).

The Suzhou River pollution has a long history. At the beginning of modern national industry, the problem came into take shape. In the 1920s, it began to be more prominent. The sewage and industrial wastewater was directly dumped into water without any treatment. After the founding of new China, with the rapid development of industry on both sides, the the water quality of Suzhou River deteriorate sharply and the serious pollution pressed the city out of breath. In 1980s, the township enterprises at the upper reaches of the Suzhou River came forth. The 53 km Shanghai territory from the Suzhou River became an all black water belt with disgusting smell, so that the riversides residents dared not to open the window. The serious pollution of Suzhou River became the shame of Shanghai people. In the previous tourist attractions, there was not any tour linking with Suzhou River.

Facing the "black belt", which is not commensurate to the international metropolis, Shanghai Municipal Government began to carry out the challenging task of "Cleaning Suzhou River" in 1950s. In 1988, the largest environmental project in Shanghai history—the urban river sewage treatment first stage project was officially launched. The investment amounted to 1.6 billion yuan. Comrade Jiang Zemin, the then Secretary of Shanghai municipal Party committee, wrote the holograph epigraph: Strong determination to construct a better Suzhou River! Thereafter, the Suzhou River comprehensive management went further. In 1996, the Suzhou River environment comprehensive management leading team was set up; in 1988, the first stage project of Suzhou River environment comprehensive treatment was started and by the end of 1999 it had been in complete functioning. In 2000, the Suzhou River comprehensive water diversion measures were officially implemented. The black and unsavory river water was eliminated basically and the fish, which disappeared for decades, gradually turned back into the river. In January 2003, the first stage project was all accomplished. In April 2003, the second stage project set out. It is estimated that Shanghai investment in environmental protection took up 3% of GDP, mostly for water pollution (Hong, 2001). After years of continuous transformation, the Suzhou River takes on a new look.

The serious pollution was caused by the growth mode of high material consumption, high energy consumption, high pollution and low technology. And a large number of factories once gathered in Suzhou River. With the industrial restructuring led by the government, the tertiary industry took the place of the secondary industry, and the real estate, tourism, creative industries have become the major industries beside the Suzhou River. Relying on the river coordinated development, the Suzhou River displayed its industrial charm with extra function of sightseeing, tourism and recreation. The right decision and forceful approaches of Shanghai municipal government make the Suzhou River, the first polluted river, back to a new life.

1.2.1. Government Planning in Industrial Era

From 1988, Shanghai municipal government began to focus on the Suzhou River sewage treatment. It took 5 years to complete the first stage project of the confluence sewage treatment. In 1993, the project dammed the industrial and living sewage of the north of Suzhou River, which was then piped into the entry of Wusong River and outflew into the bottom of Changjiang River. So the sewage will not be discharged into the Suzhou River any more. In the same year, the Second International Water Conference was held in Shanghai. Huang Ju, the then mayor of Shanghai, made a speech on the Shanghai planning, water resource protection, environment, ports and greening issues. On November 19, the conference passed the "Shanghai Declaration" without dissent. In 1996, Shanghai municipal government carried out a comprehensive improvement plan for the Suzhou River environment. In 1998, the "Comprehensive Improvement Management Approach for Suzhou River" was released. It provided a solid support for the Suzhou River comprehensive treatment. The approach aimed to enhance the water resources management, wastewater disposal and landscape improvement. So far, the total investment of 8.65 billion yuan of Suzhou River first stage project was formally launched. In 2000, the river duckweed, fish and other aquatic plants and animals became visible and the black-odor stream disappeared. In the next 10 years, a group of enterprises of intensive pollution were successively closed, stopped, merged, changed and moved out. The out of date berths and piers were removed, the coastal shabby town was also relocated. The vigor and vitality of green zone was increased at the Suzhou River sides. Due to the large-scale development and reconstruction, the landscape of Suzhou River has experienced profound changes.

In September 2001, the dragon boat race was held on the Suzhou River of Shanghai for the first time. Eight dragon boat teams from Shanghai and Jiangsu Wuxi, Yixing regions came to take part in the competition. According to Water Conservancy Press (2001), the dragon boat race can be viewed as a symbol: As a

city river, Suzhou River has really begun to change from the shipping and commercial role to the serving role of international metropolis environment.

1.2.2. The Strategic Measures of Industrial Structure Upgrade

With the development of world economic integration and information technology, the traditional industry and business beside the Suzhou River cannot keep up with the times. So the industrial structure needs comprehensive restructuring and upgrading. There are some industries having their own unique advantages, such as creative industry, business service, information consulting and intermediary service, conference and exhibition industry, leisure and tourism industry. And real estate industry grows rapidly by both sides of Suzhou River. The industrial structure develops from the low value added processing and manufacturing and low-level services to high value-added and high level productive services and life services. In light of Shanghai municipal government and Putuo district government planning, it is necessary to further harness the natural and cultural heritage of Suzhou River, improve the level of cross-strait environment building and make Suzhou River a clean, beautiful and harmonious recreating landscape and high end business district.

After liberation, the industrial structure beside the Suzhou River banks gradually developed from light industry based system into industrial and commercial services oriented system. And the industry categories are further improved and business services also maintain rapid development. The rise of the modern service industry beside Suzhou River becomes more prominent with further changes and upgrading of industrial structure by the Suzhou River. In other words, the processing industry and traditional services have changed into the modern service industry.

This change begun in the late twentieth century, and the real comprehensive shift took place after the issue of "Policy Advices on Accelerating the Development of Modern Service Industry in Shanghai". In the policy advices, Shanghai Suzhou River service area retains 11 historic buildings, such as Sihang warehouses, industrial product wholesale market, *etc*. The regional planning land area amounts to 13.43 hectares and construction area totals 420 thousand square meters. This modern service area rebuilds the old plant and former residence, attaches importance to the high-end commercial and business service functions. It becomes a modern service area with commercial business, waterscape leisure, feature tour and creative design.

Today's world modern service industry has an increasingly important role in the economic and social development. Its prosperity degree has become one of the key indicators to measure the urban and regional modernization,

internationalization and competitiveness. The current theoretical research have not clearly defined the specific concept of modern service industry. It is generally believed that modern service industry comes into being in the relatively mature industrialized stage, and it is information and knowledge intensive service industry, which rely on information technology and modern management concepts. Compared with the traditional service, modern service industry has the following merits: Firstly, its elements are intelligence focused; Secondly, it has high value added; Thirdly, it has multilevel supply; Fourthly, it has strong radiation. In the modern service industry, the producer services occupy a core position.

In the knowledge-based economy era, creative industry is a new urban industry and it includes most of culture and art commercial activities. The main representative creative industry beside the Suzhou River banks is the Chunming City Industrial Park, locating in Putuo District of Suzhou River, 50 Moganshan Road. It was originally an old textile factory built in 1932. Due to Shanghai textile system reform, this 80-year-old plant had to stop the main business of cotton wool. The historic plant area is over 40 thousand square meters. After appropriate alteration, it is opened for the unique Chunming City Industrial Park. A number of galleries and artists' studios settled there. The No. 50 on the Moganshan Road has become the largest modern artistic creation center in Shanghai. The center is full of the galleries, artists' studios, film and television production and visual arts (See Fig. **9.3**).

Leisure tourism is another industry, which has developed quickly at the Suzhou River sides. As the birthplace of modern Chinese industry, the both sides of Suzhou River have deep root of history and culture. With the innovation growth, the national industrial history tourism at the both sides has getting prosperous. Shanghai municipal government and Putuo district government also actively concentrate on the national industry historical resources. Through building national industry museum and other positive development, the Suzhou River sides will be constructed as the main platform to display national industry history and educational base for innovative talents.

With the overall rise of modern service industry in Shanghai, the high end business services industry on both sides of Suzhou River are developing very fast. It has become the headquarters or regional centers many multinational companies. The headquarters economic development has become more apparent. The investment centers, management centers, research and development centers, procurement centers, billing centers, and logistics centers of all kinds of enterprises cluster there. Shanghai municipal government has defined the modern service industries intensive area at the Suzhou River sides as the environmental

business district. It further highlights the goal of industrial development and upgrading of Suzhou River sides. The development of modern service industry is to decrease resource consumption for unit GDP and use high technology and its equipment to transform traditional industries with high resource consumption.

1.2.3. The Government Layout in the Post Industrialization Period

According to the international standards to measure the industrialization, in the initial stage of industrialization per capita GDP reaches $1,000; in the mid-term of industrialization per capita GDP reaches $3,000; in the post industrialization period, per capita GDP reaches $5,000. According to the Shanghai Statistical Yearbook, till 2003 per capita GDP of the city has reached $5,642. So far, Shanghai has entered the post industrialization period.

The wheel of history rotates rapidly. A large quantity of flour mills, paper mills and old warehouses of the industrialization era legacy have been no longer in use. The previous busy industrial space turns quiet gradually. Along the Suzhou River, rows of dwarf old houses are the disappearing landscape of the city (see Fig. **9.4**). Suzhou River, with a unique geographical location, witnessed the prosperity of river transportation and the smoke of war. It accepted the baptism of the era and related to the future of the city. Now it has become part of urban characteristic landscape system in Shanghai city planning.

"The 1999-2020 Overall Shanghai Urban Planning" made it clear that Suzhou River comprehensive improvement is the visual identity of Shanghai environment construction. The target is to improve environmental quality, protect historical style and enrich leisure life. The layout of the Suzhou River will be a unity of historical heritage and modern development, and an environmental corridor of leisure and tourism.

"Suzhou River Riparian Landscape Planning" and "Shanghai Landscape Water System Planning" highlights the idea that the river transportation function will be replaced by leisure and tour function. The riparian landscape should become the public space where visitors are willing to enjoy themselves. It can be predicted that in the next few years, Suzhou River will become an important symbol of the Greater Shanghai.

According to the Shanghai City overall planning, in the future Suzhou River is the focus of Shanghai city planning and environment resource development. The cultural characteristics, environmental quality, historical heritage and modern flavor of Suzhou River will make it and the riparian areas gradually become a beautiful water scenery and business district (See Fig. **9.5**). Suzhou River, the quietly flowing river, has experienced an earth-shaking transformation. The

improvement process is the microcosm of successful environment management of Shanghai municipal government.

Fig. (9.3). The Art Center After Transformed from the Original Chunming Woolen Factory. Source: www.expo2010china.com

Fig. (9.4). The Old Mill Beside Suzhou River Source: www.expo2010china.com.

Fig. (9.5). The Landscape Vision of Changfeng Ecological Business District. Source: www.expo2010china.com

1.3. Reinforce Environmental E-government

Environmental e-government is the environmental management through e-government. Through internet, the modern information technology, government

can realize overall interaction with the society, the enterprise and the public. It can promote environmental policies, disclose environmental information, enhance environmental protection consciousness of the public, encourage the public to participate, strengthen public surveillance and upgrade the environmental department administration. The target of environmental e-government is improve government environmental management ability to serve the public and make related policies. Based on the network and the core of information resources development, by the information application technology, the environmental e-government can accomplish the task to publish environmental information aiming at the public.

1.3.1. The Connotation of Environmental Information

As a kind of important resource, environmental information is a significant component of environmental management. It is the basis and proof for all levels of government environmental department to make policies. In 1988, the Environmental Policy Commission of European Economics Commission passed "The Aarhus Convention on Access to Information, Public Participation and Justice in Environment Field". The convention defined environmental information as follows: it covers all the information of environment, biodiversity (including genetically modified organisms) status, and possible environmental influencing factors (including administrative measures, environmental agreements, project plans, cost and benefit for environmental decision and other economics analysis and hypothesis). This definition also covers the condition concerning with human health and safety, living condition, cultural scenery and architecture, as they has been affected or may be affected by the environment condition, or they are the environmental factors, behavior or methods (Zhou, 2001). There is a close relationship between the public and environment, as everyone should live in certain environment. The time and special distribution, type and quantity of environmental information is closely related to the development of human society, utilization of resource and economical activities. Therefore, environmental information is typical public information. The open environmental information can guarantee citizen's environmental right and improve environmental protection management.

1.3.2. China's Environment Protection Information System

In recent years, China's National Environmental Protection Bureau has developed a series of environmental management software, such as "National Environmental Statistic Management Information System", "National Environmental Quality Monitor Management System", "National Pollutant Discharge Declaration Registration Information Management System", "National Ecological

Environment Condition Investigation Information Management System" and so on. These software are promoted throughout China. Considering the overall request of e-government development, National Environmental Protection Bureau has carried out the project "State Environmental Protection Bureau Office Information Platform". This system can support government management all-sided, for example, government administration, government surveillance, decision making, resources sharing and information service. Consequently, it has provided powerful technical support for the government environmental management and decision making.

As for the environmental management and auxiliary policy making, the state environmental protection information management department widely uses environmental information resources and information technology, such as network technology, multimedia technology, GIS technology, data analysis and mining technology, *etc*. Cooperating with the management of National Environmental Protection Bureau, massive information and data processing work has been carried out. It has issued a series of information reports, such as "National Environmental Statistics Annual Report", "Chinese Environmental Condition Bulletin", "National Key Rivers Water Quality Monthly Report", and "Environmental Monitoring Bulletin of Three Gorges of the Yangtze River Project". These efforts have promoted the utilization progress of environmental information resources. It has also improved the environmental supervisory efficiency and the support of policy-making.

China National Environmental Protection Bureau attaches great importance to the government website construction. It has proposed the plan of environmental information publication management and environmental information website construction. Meanwhile, environmental protection management department at all levels has also established its own websites. They can provide massive environmental information and administrative information to the public. The construction of websites at all levels has played a positive role in information communication between government and the public and establishing a transparent government (Zhu, 2004).

1.3.3. Environmental Information Disclosure

It will be an important time for Chinese economic and social development in the recent 5 to 10 years, when it is crucial to apply the economic structure strategic adjustment and reform and open policy. It will be also the important time to reduce the environmental pollution and curb environmental deterioration. In order to guarantee people's health and live and work in peace, the government and its relevant departments must undertake administrative management, business

supervision and information service.

(1) Government should strengthen environmental education and legal protection of the environmental rights.

Environmental sensation refers to the impression of environmental quality which forms in the individual brains (Peng, 2001:25). Correct environmental sensation of citizens plays an important role in positively responding to the government environmental policy and forming environmental protection consciousness. The government should not only set up environmental education curriculum in the classroom aiming at the elementary and middle school students even the kindergarten children, but also inform the public about their environmental condition through all kinds of multimedia. With these efforts the public can obtain related knowledge, values and sense of responsibility to understand, protect and improve the environment. Then they will participate in the environmental information disclosure more enthusiastically.

Citizen environmental right refers to the citizen's right of living in healthy condition, which should be protected by the country. Environmental right is one of the basic rights which citizens enjoy. Although the protection of citizen environment right has taken shape in our country, it is far from perfect. The government should strengthen legal construction to protect citizen environmental right. Firstly, in order to stimulate people's attention and strengthen the efforts in protection, the government should put citizen environmental right into the constitution and explicitly stipulate it. Secondly, government should increase the relative right of environmental right into constitution. Take *Environmental Right to be Informed* as example, the law has stipulated citizen's *Environmental Right to be Informed*, how to obtain the environmental information and what kind of environmental information they have the right to obtain. It also stipulates the responsibility that the government environmental department should undertake when it does not fulfill its duty of disclosing the environmental information. With these regulations, citizen environmental right will come true. Thirdly, the law should enumerate concrete contents of the environmental right, such as the right of sunlight enjoyment, the right of clean air and so on. Then citizens are certain with their environmental right and citizen environment right system will also be improved. Fourthly, government should make corresponding adjustment in lawsuit and relax requests for plaintiff in environmental lawsuit. Once pollutant or destructive environment behavior has been discovered, everybody is authorized to lodge a complaint to the destructors, no matter whether it has created the violation to oneself, or it has concerned with one's benefit (Sun, 2002:18). As described in Chapter 7, rural residents' environmental awareness for the problem severity is below the city and town residents. City residents enjoy more public services,

while the rural residents access to less services. There is 70% of China's population living in rural areas. So it is of great importance to increase the environmental education information coverage and improve the peasants' environmental awareness and environmental rights perception.

Some developed countries have made achievement in environmental education, and China can learn the experience from them. "Green Consumer Guide" was published by British and American countries in 1980's; "Shopping Beneficial to the Earth" was published by Japanese at the beginning of 1990's. Both of them provided concrete environmental laws and regulations for the public. The aim is to guide green production and consumption of the entire society by green shopping mode. In other words, green consumers should avoid the following products in consuming process: products that will endanger consumer or other people's health; products that have obvious pollutant effects in production, use or discard; products that have excessive packages or characteristics; products that cause unnecessary waste because of a series of reasons, such as product life is short; products are made from materials of extinct species or environmental resources; products have adverse effect to other countries. The environment-friendly-attitude toward consumption can also inspire us to realize positive growth in life quality, with zero growth even negative growth in the resource consumption and pollution discharge. In other words, appropriate consumption, advocacy of green shopping and concern for circulation will guide the public onto the new road of health.

(2) Government should take the initiative to disclose environmental information.

Government environmental information is the overall environmental condition which the government itself grasps, for example, environmental status, environmental harmful behavior, environmental protection measures. Government environmental information disclosure is an important method to solve dissymmetrical environmental information between the government and the public. And then the public is easy to obtain the environmental information, which helps them supervise the government services. Meanwhile, government should disclose corresponding mechanism to provide convenient conditions for environmental information disclosure and public participation. Usually, government takes the initiative in publishing environmental information by the following three methods:

Firstly, ways of publishing contents: Government can issue the environmental information to the public by means of environmental condition bulletin or environmental quality report (these reports may be nationwide or may aim at certain district). And it can establish a mechanism that promptly announced

information such as urban and social environmental quality, pollution discharge quantity, pollution accidents, information of atmosphere, water, sound, forest, climate change, natural disaster and so on.

Secondly, environmental warning: When certain special environmental conditions occur, the government will declare it to the public so as to call the public's attention. We call it environmental warning, such as the publication of unqualified food merchant list and enterprise list that inform the public who discharge excessive wastes. Environmental warning does not have compelling effect. The public will make correspondent response based on the influence on their own health and life. For example, once the government publishes environmental warning of certain product, it will lead to the same administrative effect as "prohibition to sell".

Thirdly, environmental symbol: environmental symbol is a sign, which is on the product or its package. It is a "proof" label, which indicates that the product is not only qualified, but also conforms to specific environmental protection requirements in the process of production, utilization and disposal. Compared with the similar product, it has the environmental advantage of lower poisons and less harms. It also saves the environmental resources. Environmental symbol is a new way by which government takes the initiative in disclosing environmental information. Based on citizen's trust to the government, it guides consumers to reduce consumption that cause pollution in the process of manufacturing. Thus it will guide the enterprises with no environment symbol to carry on reform and innovation and achieve the goal of environmental protection finally (Zhang, 2005).

In addition, government should also provide "one-station" information service. It includes environmental information disclosure, environmental protection policy propaganda, real-time environment quality data announcement, environmental project tender, acceptance of public litigation, inquiry on administrative processing of environmental protection, providing consultative service on environment administration (Li, *et al.*, 2004).

(3) Government should also promote enterprises to take the initiative in publishing environmental information.

As the main body of production and management, enterprise is the main actor of environmental pollution and destruction. They have not only the information of product and service, but also the environmental information. If enterprises do not disclose environmental information, the public will not know whether the products or services they consume are harmful to their health. Profit is the main motivation of enterprises. They are likely to cover their pollutant behavior, say

nothing about the loss they have caused to the environment. Therefore, enterprises have the responsibility and duty on disclosing environmental information on its initiative. Then the public can acquire the first-hand material and better participate in environmental protection. The main methods enterprises disclose environmental information are as follows:

Firstly, environmental report: Enterprises should release environmental reports to the public regularly. They make explanations on their own destructive behaviors, such as overall pollutant discharge quantity, enterprises' treatment to environmental pollution, improvement and enhancement of clean industry, product environmental influence, *etc*. It can strengthen the communication between enterprises and the public, which is helpful for the public to supervise enterprise environmental activities.

Secondly, environmental notification: When enterprise production behavior causes destruction of the environment, the enterprise should make explanation to the public, such as reasons of pollution, destructive degree of pollution, harm to the public, *etc*. Because it is related to the public vital interest and life safety, it is very important to be open to the public (Zhang, 2005).

A fall into a pit, a gain in your wit. The Songhua River Pollution Event, which is caused by neglecting environmental protection, warns people again: Once polluted, the environment will double the retaliation and penalty to human being. The government should take environmental inspection for potential danger at all current enterprises. Meanwhile, government should also review the industrial policy and structure, revise backward industrial policy based on environmental protection, adjust defective industrial structure from the perspective of environmental safety, make enterprises release environmental information effectively and promptly, and promote construction of environmental friendly enterprises in a down-to-earth manner.

1.3.4. Environmental Service and Information Expansion

China's government has greatly emphasized on environmental protection. But on the whole, Chinese environmental quality does not radically change for the better. The environmental comprehensive governance, especially in the cross region rivers and streams, is not optimistic. Therefore, China's environmental e-government remains to be improved. The notion of administration and the leading mechanism are the two important aspects to be taken into consideration.

1. Change traditional administrative notion and set up modern service government notion

Modern service government notion is namely public service government notion. It is proposed by western countries when the new public management movement is prevalent in the 1980's. Compared with the traditional notion, the differences are shown in Table **9.1**:

Table 9.1. Difference Between Traditional Administrative Notion and Modern Government Notion.

Differences	**Traditional Administrative Notion**	**Modern Government Notion**
1. Starting point	Based on officer and power.	Based on people and society.
2. The practical process of government work	Controlled government from top to bottom. Management is the commanding bestowing process.	The interaction between the public and the servant. They can exchange information, consult mutually to achieve common goals.
3. The alternative right of working object	The person who is served is also the person who is ruled. All kinds of services are compulsory.	Volunteer and request, ceasing illegal and unreasonable forces.
4. Locating the core function of the government	Developing economy, managing society.	Public service is namely providing public product and public service for the society, such as publishing environmental information, *etc*.
5. Assessment standard for governmental work	Administrative efficiency.	Work performance.

In the process of economic reform, Chinese government should set up the notion of serving government. Government should take the public as the center, satisfy social requirements as far as possible, provide satisfied service for the public and overcome the fetter and influence of traditional administrative idea. Consequently, the ability of controlling social development will be improved and environmental management will also be promoted.

To provide the community with accurate and timely environmental information can allow the public know the quality of the environment and enterprise sewage discharge status. It is a practical measure for the government to serve the public and encourage the public wisdom, opinion and participation. For example, to hold a hearing for broad understanding of public view and collecting their wisdom before making decision on some major environmental policy. It will ensure the scientific, legal and democratic decision making. On December 7th, 2005, "Approach to Promote Public Participation in Environmental Impact Assessment" was issued on the State Environmental Protection Agency website for public comments. Its forward-looking and operability provisions will widen the channel for the public participation in environmental protection greatly.

2. Break through administrative division and realize environmental information

omni-directional cover beyond space and time.

Administration division refers to the relative independence of certain administrative region and certain organization. Facing the difficulties, the government should fully complete the assessment of environmental effect. In order to minimize the destruction, the warning system of environmental destruction and feedback of environmental information should be done in a wide range. Environmental warning is the prompt reports on the inverse succession, degeneration and deterioration of the environment quality and system. It has advanced function of prescience and forecast, alerting roles to detect the tendency, direction, speed and consequence of evolution, and basic and scientific function of environmental treatment and construction service (Cheng, 1996:18). Environmental warning system includes warning monitor system, data display system, information feedback system and result assessment system. The process chart is as Fig. (**9.6**) shows.

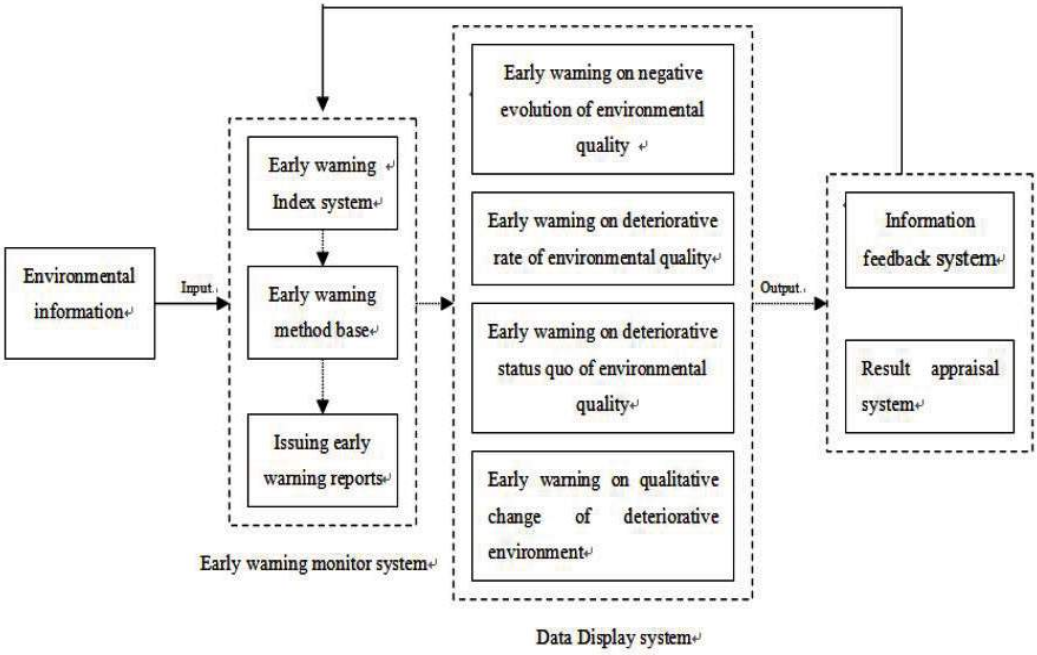


Fig. (9.6). The Process of Warning.

According to the above chart, environmental information collected is put into the early warning monitor system. In this system, the information is selected by the index system and treated by the method base. The forecast methods commonly used are brain storming, Delphi Technique, analytic hierarchy process, relative

tree process and so on. By comparing the result with the normal or ideal value, it will produce the different types of environmental warning information. Finally, the result of warning is assessed through the warning feedback system and returned to the warning monitor system in order to improve the system function. With the environmental warning system, the public can not only understand the environmental information promptly, but also understand environmental development direction and enhance environmental urgency sense. It is also convenient for the government and enterprises to take prompt measures to prevent environment from deteriorating.

The unbalanced regional development intensifies the destruction of ecological environment. China should follow the environmental rule, break the limitation of administrative region, emphasize on certain rivers or lakes to establish special environmental protection organization. For example, set up environmental protection administration of Huai River and Nansi Lake, set up specific administration and fund, arrange specific person to take responsibility for specific work. At the same time, it requests coordination between various provinces and counties in order to make the treatment effect better. Meanwhile, it is necessary to take environmental protection into the achievement assessment of various administrative regions. The achievement assessment of leading groups that are purely economic-oriented should be changed. Related departments should assess resource productive efficiency and improve the condition of environment quality more integrally. The methods of assessment should pay great attention to the feedback of neighbor administrative region, especially in the downstream areas. Those officials, who make economic development at the cost of resource waste and environmental destruction, should be punished instead of being recorded for achievement. If serious problems occur, permanent investigation system should be established to warn people of environmental responsibility (Wang and Zhang, 2005).

With the launch of environmental e-government, government has further reduced its administrative classes in environmental management. In terms of the principle of simplification, uniformity and efficacy, and meeting the requests of execution, supervision and coordination, government at all levels must reform and enhance decision-making mechanism on a more scientific and democratic basis by internet information system, and expand the utility of environmental information in depth and breadth continuously in order to meet the environmental information need of people in various groups.

2. ENTERPRISE SELF-REGULATION

Michael P. Porter pointed out that one of the most important aspects to enhance

national competitiveness is that the business environmental resources protection of the entire country and effective use. The micro performance of enterprises will influence the survival and development of the whole country in the world. The data show that the environment management of most enterprises in the United States is from low level to the advanced stage of development (Fischer and Schot, 1993; Post and Altman, 1992). Chinese enterprises conscientiously fulfill their environmental responsibilities can meet the requirement to implement scientific development concept and build a harmonious society. It is also the inherent requirement to enhance their own competitiveness and adapt to the international economic development. ISO140001 implementation and environment culture construction is the core content of CER.

2.1. ISO Environmental Management System

The aim of ISO14001 system is to support the environment protection, improve and maintain the environmental quality, reduce environmental pollution caused by human activities so as to achieve the balance between the social and economic development and promote the sustained economic development (Yu, 2001). ISO14001 is a framework of standards with no absolute requirement for business environmental performance. Therefore, it is not a mandatory standard. According to their own circumstance, enterprises can use the standard in the whole or just some departments. ISO14001 standard can be used as the basis of third-party audit and certification. Through the establishment and implementation of ISO14001 standard, enterprises can get the third-party audit certification.

The terms of corporate stakeholders have been added into ISO14001 system. Corporate stakeholders can be group and also can be personal. Corporate stakeholders may directly or indirectly influenced by the activities of business operations. Companies may also cause the loss of economic or welfare. The important business stakeholders can be classified as the internal group and the external group. The former refers to the internal employees and partners, the latter includes all related independent individuals and organization. In this book, the stakeholders are regarded as management (shareholders), employees, investors, consumers, suppliers, contractors, government agencies, financial lending institutions, the surrounding public and the community, various research institutions and universities, environmental groups and organizations and the natural environment, *etc*. Facing the environmental crisis, companies should recognize that the natural environment, on which they exist and operate, is the most important stakeholder. To learn and use ISO14001 strategy and build corporate environmental culture is the focus of China current stage of development.

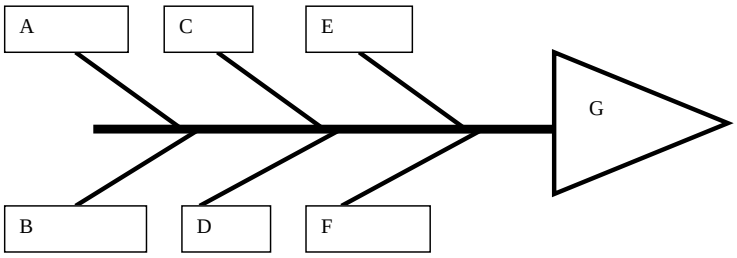
2.2. ISO14001 and Corporate Environmental Culture

The limitation of the market economy leads to the inconsistent tendency of production and consumption, such as spontaneous, blind and caring solely for profit, *etc*. It makes companies indifferent to the public interest and consumes the public product such as air and water recklessly. Such free market can not guide enterprises to develop sustainably. It is difficult to reverse such phenomenon only by market mechanism. It must resort to moderate government intervention, which need to be based on law. But law and regulations sometimes are not sound. Then it is necessary for the enterprises, as the social members, make reform and innovation. Through corporate environmental management—ISO14001 system implementation, corporate culture can be elevated to a more advanced culture—corporate environment culture, which can enhance the competitiveness of enterprises. ISO14001 system is regarded as the improvement of ISO9000 (Quality Management System) and QS9000 (Mandatory Quality Management System of Automotive Industry). The latter two criteria have been successful in practice. They concern the reducing pollution of the whole process and stress the whole process control. To implement ISO14001 system and corporate culture change and construct green corporate culture is an effective way to ensure the evergreen China's enterprises.

When the enterprises implement ISO14001, resource utilization and environmental impact should be considered as equally important as product quality. In terms of the mission of enterprises, the principle is to meet the needs of shareholders and create more profit and value for them. In order to achieve the long-term development and create long-term profit for shareholders, the enterprises must prevent their biggest stakeholders—the natural environment—from being damaged. Some investors have begun to accept the concept "Wealth Producing Responsibility". They believe these enterprises with clean cultural ethics can have high returns successfully in the competitive free market. The simplest reason is that these clean ethical companies will not be limited or influenced by the future legal provisions. Study of German capital markets shows that the environmental ethic investment is more profitable than the average investment. In addition, due to the cultural pressures and impact of social movements, some assessment agencies have the increasing awareness to evaluate corporate environmental impact. It can be further speculated that more and more capital providers (banks, investment companies, *etc*.) will feel interested in such investment.

ISO14001 system centers the whole process of prevention and continuous improvement. Through the establishment of self-monitoring and self-improvement management system, it encourages enterprises to achieve economic

and environmental development. In order to fulfill the target of the enterprises and enhance their competitiveness in the market, the system requires the enterprises to use the system view to evaluate environmental factors of their activities, products and services, and apply control. ISO14001 system provides a full and complete support for scientific and environmental management tools for China's corporate environmental management, reflecting the ideas and methods of China autonomous environmental management under market economic conditions. According to statistics, until February 24, 2004, 61,287 enterprises got the ISO14001 certification in the world. Even though 5,064 Chinese enterprises got ISO14001 certification, there were only very few of many enterprises in China. And fewer of them disclosed environmental information. Therefore, to build environmental enterprises should be the target of today Chinese enterprises. The environmental enterprises are those implement ISO14001 system and construct environment culture (as shown in Fig. **9.7**). Environmental enterprises can not only promote cleaner production, create "National Environmental Friendly Enterprises", but also go beyond the green trade barriers and be powerful to meet the challenges of international market competition.



Notes: A: Environmental Policy B: Plan C: Implementation
D: Operation E: Check F: Review D: Continuous Improvement

Fig. (9.7). Operation Mode of Environmental Enterprises.

2.3. Environmental Enterprises Implementation

Supported by the developed and developing systems, such as green taxation system, environmental subsidy system and environmental enterprises preferential policies, extended producer responsibility policy, China's enterprises should strengthen self-discipline and move toward ISO14001 system.

2.3.1. Transferring to the ISO14001 Strategy System

Environmental management strategy for business is to do its utmost to reduce the negative impact of product throughout their life cycle within the environment. Through the implementation of various environmental projects and technologies, the environmental management system prevents negative environmental impacts

and improves environmental performance. Management system project includes staff training and education, internal environmental audit and continuous monitoring of the production process. Corporate environmental management strategy is divided into three levels: simple compliance with environmental laws; environmental competitive advantage strategies to improve partial performance of the enterprises; sustainability at the process design, equipment investment for the best environment. Supply chain enterprises in the environmental interaction come from the interaction between the government, suppliers, brokers, consumers, and competitors. And members of the supply chain must consider environmental issues from the perspective of the entire system.

Most Chinese enterprises are in the compliance stage of the strategy. Even if they implement environmental management strategy, they comply with minimum standards of environmental laws. China should integrate the existing enterprises management system with ISO14001 environmental management system, build the corporate environment culture. After solve the easiest environmental issues by law, China should turn to the environment competitive advantage strategy stage. While changing their behaviour, enterprises should exert influence to change the behaviour of consumers and the public and move toward the direction conducive to business development. Following the "reduction-reuse-recycle" principle, environmental enterprises can carry out environmental improvement and innovation, extend enterprise culture latitude and take precedence over other competitors in the implementation of progressive environmental management strategy, and form the core value of enterprise specific competitiveness. At the same time, they can get the support of consumers, banks, government and public stakeholders through environmental innovation, in turn, they can control and restrain the competitors on the market.

2.3.2. Change in Senior Management

Many business managers disdain for energy conservation. They think that energy consumption is only one small part of all cost components. However, they do not recognize that energy conservation not only has quick effect but also bring enormous benefits. This requires executives to change their minds, recognizing the importance to improve resource utilization, reduce environmental investment and increase business performance. Environmental pollution will waste resources and manpower and lose the value of consumers. To improve the environment management is not an annoying burden, but a good opportunity to develop economics and strengthen competitiveness.

For the environmental issues, managers should avoid overly pessimistic or negative attitudes. And they should avoid too much emphasis on environmental

issues and cause unnecessary costs to shareholders. With ISO14001 as the system of implementation of environmental management strategies, enterprises have to face more important environmental issues which have greater impact. To address these issues, corporate environmental culture will perform its functions. Environmental protection innovation has become the core competitiveness, which enables the enterprises to adapt to the times and human choices earlier than competitors in the market.

Enterprise managers should change their ideology automatically. They should build a harmonious and symbiotic connection between business and the natural environment. In light of the ISO14001 system, senior managers should appoint a dedicated manager as the environmental officer. The middle management staff of major management and production plant should compose integrated environmental management group. The role is to make environmental policy, examine the environmental protection system and working plan, study the environmental protection measures, implement the environmental protection task, issue the environmental indicators and make environmental management into an important component of business management. The environmental target responsibility system for the managers' term should be implemented. Managers at all levels are the primarily responsible person for the department of environmental protection. Their performance should be included in the annual assessment. A series of environmental quality standards and inspection appraisal system should be made. Combining with the rules of ISO14001 system, environmental officer should conduct an environmental survey of all production processes, identify the environmental factors, assess the significant environmental aspects, make the programs of pollution prevention procedures, resource utilization, energy and material saving, *etc*. The formation of the system and program documents can make the corporate environmental management more scientific, institutionalized, standardized and legalized. Senior managers should balance multiple stakeholder interests and advocate the purpose of company management is for the benefits of any groups who have interests in the enterprise. They should establish a credit with each group of stakeholders (not just the shareholders). Through SDS thinking, they can analyze the development of the society and identify the favorable business opportunities from it.

2.3.3. Implementation of Total Environmental Management Strategy

China's enterprise implementation of total environmental management strategy is a complex system engineering. It involves the entire product life cycle of product research and development design, manufacturing, sales, use, scrap processing and recycling. It also includes management strategy decision, market research, raw materials and spare parts supply and quality management.

2.3.3.1. Research and Development Department

Quality and environmental management are closely linked with each other, in which product and process design is the key to reduce waste pollution. Product and process design directly influences product packaging, transportation, persistence and disassembling, *etc*. As a tool contributing product recovery, reuse and recycling, environmental design can test the product environmental impact in design stage. This "from cradle to grave" analysis of full range of program goes beyond the boundaries of enterprises at the operational level, covering the assessment of the products of all inputs, product consumption mode and final disposal of detection. The environmental design surpasses the production boundaries and involves a very broad space outside the enterprise (including technical, environmental experts, the final consumers and even the community representatives).

Environmental design includes these environmental-oriented aspects: product design, including product energy program design and product structural design; production environment design or reorganization; process design; product packaging solution design and recycling program design.

The most important environment-orientated product design should meet the following criteria: selection of non-toxic and harmless materials to reduce health hazards and safety risks; selection of light, energy saving new materials to reduce product weight and energy consumption of resources; selection of renewable, recycled new materials to reduce resource consumption and facilitate scrap processing, biodegradation and recycling; selection of waste as part of the product raw materials in the production process to realize waste recycling and improve resource utilization; Product design should be conducing to reduce the processing operations and production assembly, such as reducing the number of parts, reduce raw material types and facilitate manufacturing and energy reduction; use advanced environmental technologies to reduce pollution emission during product use period; use recycling design, including detachable and modular design so that the product repair can be facilitated and parts of the products can be updated at the end of product life. And resources can be reused to reduce the difficulty of dealing with the scraped products and resources efficiency can be improved; The design of product packaging should also be reasonable and ensure the clean, safe, harmless, recycling or natural decomposition of the packaging materials in order to improve the durability and reliability of products to meet consumer demand.

Technology innovation of research and development department is very important. It concerns how to improve resource productivity and eliminate pollution and waste fundamentally. Reform, which reduces harmful emissions and

improves resource productivity, can bring higher output, adapt to higher process innovation and even help to improve product performance and toughness. Many foreign companies seek products and services premium by means of environmentally friendly products and has opened up new markets.

From the 12th International Automobile and Manufacturing Technology Exhibition (Auto Shanghai, 2007), 30 auto enterprises staff were taken as interviewees, such as the representatives from Shanghai Huapu Auto Ltd., Tianjin First Auto Ltd, Dongfeng Nissan, Honda Technology Research, Tongji Tongjie Ltd and so on. Now 12 excellent domestic auto enterprises (such as Geely, BYD, Zotye, Brilliance and Breeze, *etc*.) and 12 international auto enterprises (such as Toyota, General Motors, BMW, Accord, Volkswagen, *etc.*) are selected to have the contrast study of automotive emission standards. Table **9.2** shows the result.

Table 9.2. Contrast Study of Automotive Emission Standard.

	Euro II	**Euro III**	**Euro IV**
state-owned auto enterprises	1	9	2
non-state-owned auto enterprises		4	8

The result shows that 75% domestic auto enterprises have met the Euro III emission standard, while 67% international auto enterprises have been up to the Euro IV emission standard. Therefore, a big gap can be found. However, Guangzhou Honda, the state-owned enterprise takes the lead on environment management: it met Euro IV requirements and got ISO14001 certification in 2001. The recycling utilization rate of automotive accessories is 90%, and 70%-90% of automotive accessories are made in China. One highlighting point is that the Zengcheng (Guangzhou Honda) plant accomplished wastewater zero discharge for the first time. And the Environmental Management System certification rate of its 89 suppliers is 68.5%. Comparatively, FAW-Volkswagen got ISO 14001 certification one year later. After disposal, waste water is discharged, and the recycling utilization test of automotive materials is in trial.

On November 16, 2006, Chinese government published the first “green list” of government procurement: government can only choose nine vehicles which are environmentally certified brand. In the future, government agencies, institutions, organizations must give priority to “green products” when they implement government procurement with financial funds. The finance department may refuse to pay the purchase funds for those units who do not follow the procurement rule. According to Beijing Times, nine brands in the green list official car procurement were locked by the Ministry of Finance and Bureau of Environmental Protection: Dongfeng Peugeot, Dongfeng Citroen, Nissan, Siwei, Audi A6 and A4, Bora,

Jetta, Caddy, Modern, *etc*. The listed models under each brand all got China Environmental Labeling Product Certification. Green government procurement focuses on non-state-owned brand cars. Undoubtedly, it is a powerful stimulation for China's domestic auto companies to make technological improvement.

On 13 December 2006, the European Parliament issued a new vehicle emission standard—Euro-V and Euro-VI standards. According to the new standards, EU will limit the pollution emissions of local cars and imported cars more strictly, especially the emission of nitrogen oxides. Euro-V emission standard was implemented on 1 September 2009. Euro-VI standard will go into effect in September 2014. Consequently, people's health will be benefited increasingly. In contrast, the emission standard of China is Euro-I or Euro-II, lagging behind. Moreover, the time of applying the standard is at least 7 years later than the European countries (Tong, 2006). "Government Policy + Enterprise Action" will be the corresponding strategy.

2.3.3.2. Raw Material Procurement Department

Active procurement includes supplier selection and evaluation, supplier development, integration of the environmental practices of suppliers. Enterprises can work with suppliers to encourage them to reduce packaging materials and use those materials which can be recycled. Corporate procurement staffs have greater power to buy environmentally friendly raw materials which can be recycled, in order to cut down the use of resources and promote product reuse and recycling. Reducing resource use refers to minimize waste emission to get a more efficient use of the process; Reusing products refers to use the same parts of the same form with no need to re-manufacture. It is also a form to reduce the use of resources; Recycling is a kind of process, mainly collecting, processing and manufacturing those waste products into new ones.

For the so-called savings, most enterprises use lower-priced model of the transformer power supply for the office and plant. However, as these transformers consume too much energy, the enterprises have to pay huge costs. Therefore, in the purchase of small items, enterprises should not only consider the cost of the object itself, but also consider the cost of operations in order to avoid the huge waste generated in the using process.

2.3.3.3. Production Department

Enterprises should realize clean production. Clean production includes four concepts: The first is to use clean energy sources. It includes rational use of conventional energy sources, full use of clean and renewable energy, for example, hydro and tidal power, develop new clean energy and promote energy saving

technology. The second is to adopt clean production process. It means little or no toxic and hazardous raw materials and intermediate products; less high risk factors in the production process, such as high temperature, high pressure, flammable, explosive, noisy factors; higher efficiency of production equipment; improved management, enhanced process control and reduced emissions of waste and pollutants. The third is to make clean products, save raw materials and energy. It means little or no use of precious and rare raw materials; no impact on human health and ecological environment in product reprocessing and using process; improved product life and easily recycled scraped products. The fourth is to implement the control of the whole process according to the principle of life cycle analysis and based on pollution prevention and resources conservation. The strategy of product responsibility is to provide long-term and high quality products and services for customers, who can enjoy the effect of minimal negative environmental impact.

2.3.3.4. Marketing Department

Implement green marketing and select green channels of distribution. Reduce the number of product promotion directory in marketing. Try to use television advertisement or internet advertisement and other forms to achieve the purpose of selling. Manage the distributor and franchise stores and recycle the packaging and other waste in sales process. Carry out e-commerce, provide goods and services directly to consumers and reduce the generation of intermediate links waste.

Reverse distribution plan is essential. Reverse distribution is a reverse logistics, including product packaging and waste products collection. It requires enterprises to establish good customer relations with consumers, make record of the use of product, track product information, assess product life cycle and timely recover the product packaging and discarded products. In Germany, enterprises and their product retailers are obliged to recover the product packaging, which consumers do not need, in order to prepare for next packaging. China's enterprises should establish channels to facilitate the collection and classification of waste and set up functional departments for the recovery. With good relations with various distributors, enterprises can require and guide them apply reverse distribution plan, manage franchise stores, guide the consumers to make them willing to participate in the reverse distribution plan in order to achieve business closed-end operations.

2.3.3.5. After-sales Customer Service Department

After-sales service department should timely detect and feedback the problems in consumer using. The research and development department should redesign and improve the product defects and track and log product life cycle, guide consumers

to the proper use of products, extend product life, be responsible for product returned maintenance and provide quality services. In the process of after-sales service, employees and consumers in direct contact is the best time to convey the corporate environmental concept. The enterprises can directly obtain consumers' information and needs, recycle the waste parts after repair and further explain the use methods of their products. This will better provide consumers with smaller environmental impacts service to enable them to understand and assist enterprises to complete the recovery work and extend the life of the product effectively. Thus, the customer loyalty will be enhanced. In the future, the enterprises will change their role from providing product to providing service for the society.

2.3.3.6. Waste Management and Recovery Department

After-sale customer service department should provide complete product life cycle assessment records and consumer use records and the recycling conditions for waste management and recovery department. The waste management and recovery department provides information of disposal or recycling of waste products. It assists the technical staff of research and development departments to optimize the various stages of product life cycle, design services and extend the product life.

Business managers, technicians and general staff should seize the opportunities for environmental innovation to explore and research and find solutions for enterprises themselves, products and services. The concept of waste should be converted as resources which are put in the wrong places and can be recycled. For the non-recyclable waste, the natural environment degradation should be used to minimize the environmental pollution.

2.3.3.7. Infrastructure and Logistics Services Department

Enterprises should make reasonable technological transformation of the factory building structure, office, refrigeration and heating devices to save electricity energy. More importantly, the staff working environment should be more comfortable, have higher visibility with less noise. Consequently, labor productivity and product quality will be increased.

With the changes in the business operation environment and production system, the various and small batch product will have far-reaching impact on the business logistics system. The environmental reform of the logistics system still continues. The supply chain companies can use ISO14001 as a tool for their environmental management, and also assist other companies in the supply chain or the entire supply associated members to complete systematic environmental management (Liu, 2005).

3. PUBLIC PARTICIPATION

There are different levels in the breadth and depth public participation. Some are the direct and indirect self-discipline types in controlling population, resource conservation and environmental protection issues; some are the types, such as early warning, supervision and allegation, to regulate others' environmentally harmful behaviours. Some are the public welfare participation for various sustainable development; some are the political participation in promoting government to implement sustainable development through various means or social groups. Public participation in environmental management not only reflects the improvement of the resident environmental awareness, but also forms an indispensable social driving force to implement CER (Xiong, 2007; Chang, 2004; Qu, 2005; Liu *et al.*, 2006; Koontz, 2006; Free, 2001; Hong and Luo, 2006; Hanson, 1993).

3.1. Proper Consumption

Proper consumption is simple consumption, it is to meet the basic needs rather than endless possession of material resources. For example, consumers should control unnecessary consumption, especially the fashion consumption, in their daily lives to resist the excessive packaging of goods and prefer to buy less packaging or reusable packaging. Proper consumption is green consumption. It requires consumers consciously resist the product and behavior that have negative impact on the environment. For example, they should buy the environmental friendly and healthy green product; Proper consumption concerns about the cycle of consumption. It requires the repeated use or recycling of resources and their products as much as possible. The public effective use of product means to reduce energy and resource consumption and increase the durability and life of the product. Consumers should actively accept green design philosophy and sacrifice part of their economic interest to buy the products of environmental companies. Meanwhile, they should fully understand the new energy saving products and technologies. They should obtain the detailed description and explanation of the use of product form producing enterprises to prolong the life of product and reduce the impact on the environment.

3.2. Social Service

Through editing energy-saving manual, joint training, lectures, competition of energy saving, energy-saving supervision, commitment to energy-saving activities, social organizations can initiate the public to carry out energy conservation in their daily work, life and travelling, and effectively prevent the climate warming caused by environmental pollution.

Environmental organizations can set energy conservation advertisement in the bus station, subway, light rail and other modes of transport to publicize the theme "energy saving and environmental protection". These flowing scientific "lectures" can promote the use of energy saving lamps, energy-efficient refrigerators, electricity saving tips. And the travelling public can get the popularization of energy saving knowledge.

The closed economic loop of "natural resources—products—renewable resources" must rely on social service to be completed. The feasible approach is to establish a special NGO for recycling of packaging wastes. It accepts the commission of enterprises, organize the receivers to recover and classify the packaging waste and then send to the corresponding resource recycling manufacturer for recycling. These packaging wastes, which can be directly reused, will be returned to the manufacturers.

3.3. Non-government Involvement

Public participation in environmental management refers to social actions, which has the subject of social, social organizations, units or individuals, within the scope of their rights and obligations in environment protection (Wang, Chen, 2005). To be specific, it is a continuous two-way exchange of views in process, to increase public understanding of government agencies, collective units and private companies, which are responsible for the investigation and solve the environmental problems of practice and process. In the process, the public will be fully informed of various projects, plans, planning, or policy formulation and assessment activities at any time. In order to promote public participation in exchange of information, all concerned citizens will express opinions and suggestions on design project decision making and resource utilization, the preparation and formation of solutions and management countermeasures (Shi, Chen, 2010).

3.3.1. The Importance of Public Participation in Current Environment Management

The environmental pollution negatively influences the public health and living quality. The public participation is an unstoppable force to supervise these polluting enterprises, especially those pollute the air nowadays.

When we discuss environmental air quality, we mean those VOCs that participate in photochemical reactions. The term "VOCs" refers to those organic liquids and/or solid compounds that, under normal temperature and air pressure, may spontaneously evaporate from the liquid or solid form of the compound and enter the surrounding air. Some VOCs, such as terpenes used in perfumes, are not

harmful. However, many compounds are damaging to human health. For instance, regular contact with overpowering smells can seriously affect quality of life; People with respiratory diseases are particularly sensitive, even to low levels of VOCs; The solvents in many kinds of VOCs are lipid-soluble, so they are easily absorbed by the lungs. Their ability to go through the blood-brain barrier can lead to damage to the central nervous system causing an absence of concentration; Contacting with large quantities of VOCs can result in dizziness, hearing problems, pale complexion, nausea, muscle spasms and even loss of consciousness, convulsions or even death; and long-term exposure to VOCs will cause memory loss, mental health issues and asthma, and may also lead to a higher risk of birth defects and tumors.

Apart from direct health risks, VOCs are also damaging because they are the precursors to ground-level ozone and PM2.5. When nitrogen oxides react with VOCs in sunlight, two types of pollutants can be formed: The first are secondary organic aerosols (SOAs), which are a major contributor to PM2.5; The second is ozone from photochemical reactions, which boots the concentration of ground-level ozone and exacerbates the severity of smog.

Recently, ozone has become the chief pollutant during springs and summers in North China, East China and the Pearl River Delta. The 2015 China Environmental Bulletin shows that 74 cities saw ozone as the only pollutant to enhance in concentration on average during the first stage of monitoring for new air quality standards. It was also the only pollutant where the percentage of cities complying with standards decreased. On the days where pollution exceeded standards in the Pearl River Delta's nine prefecture-level cities, the number of days where the primary pollutant ozone was the greatest, standing at 56.5%. This figure is 17.5% higher than the number of days for PM2.5. Upon investigation, the sources are likely nitrogen oxide from vehicle emissions and fixed sources, and VOCs emitted by industry and everyday sources.

With the aim at controlling the PM2.5 count and photochemical smog, this situation indicates that VOCs must be controlled. To improve the current air pollution problems, in 2013 the state council issued the atmospheric pollution prevention cure action plan (hereinafter referred to as the "Gas Ten"). Generally, Gas Ten requires "to form the government, enterprises, market driven, public participated mechanism of prevention and control of atmospheric pollution", to achieve the goal of total emission reduction and quality improvement.

Since 2013, the state has issued a series of laws and regulations and measures to manage the information disclosure of key polluter units. It included "National Key Monitoring Enterprises' Self-Monitoring and Information Disclosure

Methods (trial)" executed from January 1, 2014; "The China's Environmental Protection Law" and "The Public Measures for Environmental Information from Enterprises and Institutions" executed from January 1, 2015; "China's Air Pollution Prevention and Control Law" executed from January 1, 2016. In particular, the new executed atmosphere law clearly requests "units should focus on installation and use of automatic monitoring equipment, pollutants emission and connected to the internet of the responsible department of environmental protection monitoring equipment, and ensure the normal operation of monitoring equipment, and disclose publicly emissions information in accordance with the law". Otherwise, the enterprise will face "fines of more than 20,000 yuan and less than 200,000 yuan", and those who refuse to make corrections shall be ordered to suspend production.

Although a lot of efforts have been made in controlling air pollution, the arrival of the inflection point is still not seen. The most important reason is not the barrier of technology and capital. The biggest obstacle results in our motivation mechanism problems, in other words, the environmental law enforcement is lax, local government GDP development is placed prior to environmental protection. The international practice is pushed by environmental litigation law enforcement, but environmental litigation in China is rather difficult.

According to Ma Jun, the founding father of Institute of Public and Environmental Affairs (IPE), "Skoll Social Entrepreneur Award" winner, and Blue Map APP developer, public participation is the motive force to stimulate the pollution treatment. And the public must be informed to participate. For the implementation of environmental law and the relevant requirement of atmospheric method, the public right to know and to supervise and promote the mass reduction pollution sources should be safeguarded. 29 public organizations, including the IPE, Friends of Nature, SEE Foundation, put forward "Promoting Regional Control of Air and Water Pollution: Proposal for Information Disclosure from Key Pollution-Discharging Entities". The main content is as follows:

I. Provincial environmental protection department and environmental protection departments of prefecture-level cities across the entire nation shall, as soon as possible, determine a list of key pollutant-emitting entities for air emissions and wastewater in their respective jurisdictions and publish it according to law.
II. According to the requirements of the Air Pollution Prevention and Control Law, key pollution-discharging entities for air emissions shall install and use equipment to automatically monitor their emissions of atmospheric pollutants and the equipment shall be connected to the monitoring equipment networks of environmental protection authorities to ensure regular operation of

monitoring equipment and disclosure of emission information in terms of law.

III. In light of the requirements of the Measures on Environmental Information Disclosure for Enterprises and Institutions, key pollutant-discharging entities for air emissions and wastewater shall, by means of provincial-level platforms for the release of automatic monitoring information for key monitored enterprises, disclose environmental information.

At the same time, the project team also investigated the disclosure of key polluting entities list and on-line monitoring information release. It is found that the content of the two executions are facing greater challenges. Under the full disclosure of environmental information, the full involvement of all sectors of society can form a joint effort to monitor pollution, thus leveraging pollution reduction.

3.3.2. "Internet + Environmental Protection"

The Institute of Public & Environmental Affairs (IPE) is a registered non-profit organization. When it started in Beijing in May 2006, IPE established two pollution databases to monitor corporate environmental performance and facilitate public participation in environmental affairs. It aims to release environmental information to the public, and allow communities to fully understand the hazards and risks in the surrounding environment. Thus the widespread public participation in environmental governance can be promoted[1]. In 2006, IPE set up a database of polluting enterprises. It allowed the public to obtain data that companies did not meet the standard emissions. Since its launch in June 2014, the Blue Map has integrated online monitoring data of over 10,000 key sources of pollution. Not only will the public get real-time emissions data, but also they will also be shared easily through social media. As more regional environmental protection departments developed government affairs microblogs, Blue Map users can @ the local environmental protection department's official microblog, forming a "micro-whistle-blowing", when they share the bid records that enterprises exceed.

Up to June 2016, the Blue Map pushed more than 600 key pollution sources which have on-line monitoring over standard data problems to make a public explanation. These sources even included large state-owned enterprises. Some has made practical improvement and achieved the pollution reduction.

In addition, the public use Blue Map for the micro complaints, as it also provides support for local environmental law enforcement. Those enterprises which received public complaints for over standard on-line monitoring data and verified by environmental protection department to commit overweight violations paid fines in accordance with daily plan, and was ordered to stop production for

governance.

More feedback is found from enterprises in eastern areas. The response to complain about the excess online monitoring data of the Blue Map are mainly distributed in the Shandong, Zhejiang, Jiangsu areas. A total of 455 enterprises responded to the complaints, 75% of the total, notably in Shandong area (as is shown in Fig. **9.8** and **9.9**)[2].

In Shandong area, 17 cities made acceptance and response to complaints from Blue Map. For 2 years in Shandong province, a total of 312 key polluting enterprises carried out the explanations to the public about the online monitoring data of overweight complained by the net friends. As incomplete statistics show, the total number of communication reached 550 times, accounting for 58.1% of the communication frequency.

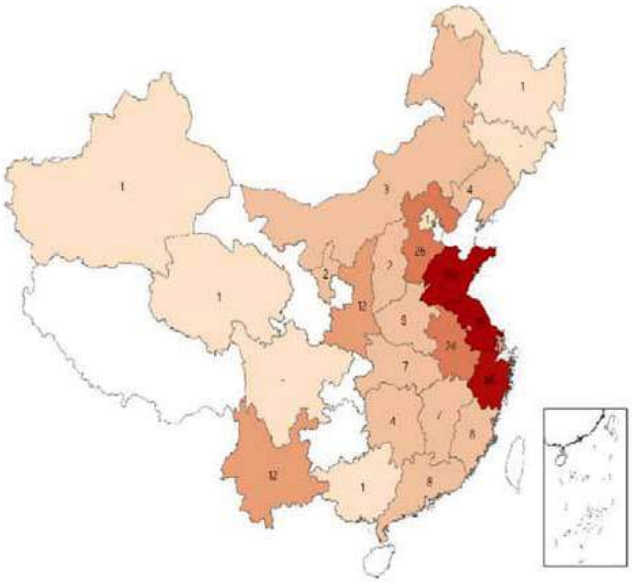


Fig. (9.8). Number of Responses and Frequency of Communication by Blue Map Enterprises.

In the responding enterprises to the Blue Map microblog user complaints, there are 517 enterprises, which involve gas emissions, accounting for 85% of the total profile. This indicates the current problem of air pollution severity, and public concerns about air environment. In the 517 companies, which responded to the exhausted gas complaints, the quantity of power/thermal enterprises is as high as more than 300, accounting for 60%. And it is followed by the chemicals industry, and the next comes the non-metallic mineral products, mainly from the glass and cement enterprises (as Fig. **9.10** shows)[3].

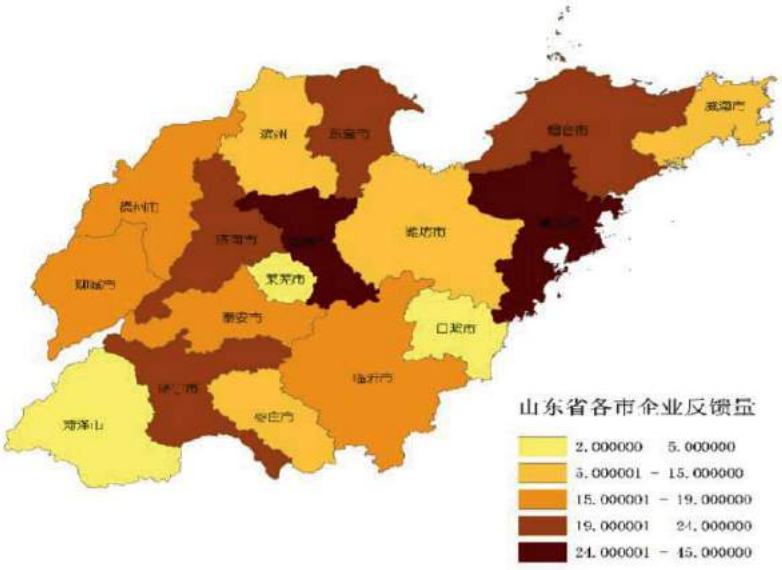


Fig. (9.9). Number of Responses from Blue Map Enterprises—Shandong Region.

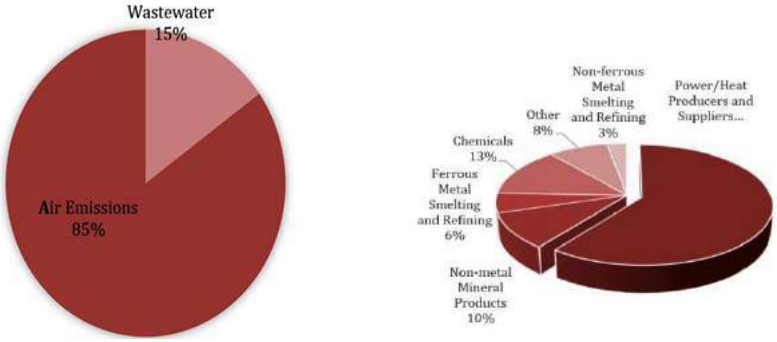


Fig. (9.10). Responses Divided by Type of Industry.

As the product of "Internet +", the micro whistle blowing is an important function of "Blue Map". It enables the public to participate in environmental protection anytime and anywhere.

For example, in some provinces such as Zhejiang and Shandong, the public and the environment achieve the interaction unprecedentedly: the public use the App to get the government public data, and then forward the information through the microblogging, @ the environmental protection department to promote the environmental protection department to follow up and supervise the pollution

enterprises actively, and make direct rectification. At present, the APP has successfully contributed to more than 400 large-scale thermal power, steel, cement, building materials, chemical and petrochemical enterprises to make explanations online data which exceeded bid. Quite a batch of them have or are taking corrective action. All of this is based on the online monitoring environmental data pushed by the environmental protection department and many large companies did it in real time in 2014.

Therefore, public participation proves to be the effective way to solve the atmospheric pollution problem. To a great extent, the innovative use of APP by IPE raised the environmental risk awareness of the public. It is the effective mechanism to help the public obtain the environmental risk information and take part in the environmental safety supervision. The environmental information disclosure model of "Internet + Environmental Protection" really discloses the pollution of related enterprises to the public. Public participation is not just beneficial to the public, it is a win-win process. In this way, relevant enterprises strengthen environmental governance, which is positive for their own sustainable development.

4. SUMMARY

In summary, the trinity and cooperation of the government, enterprises and public is the general idea to improve CER. Among them, the extended producer responsibility policy, industrial structure upgrade and environmental e-government construction are the measures of government regulation; the implementation of ISO14001 system strategies and construction of environmental culture is enterprises self-discipline to reach the goal of effort; green consumption, social services and non-government involvement is the further manifestation of public participation. In particular, with the innovation of "Internet + Environmental Protection", the pollution source becomes the feedback subject by public supervision.

Based on the SDS perspective, all the parties should reach consensus and make effort in practice. Thus the corporate environmental quality and performance will be greatly enhanced, social economic and environmental benefits will also be improved subsequently.

DISCLOSURE

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NOTES

[1] http://www.ipe.org.cn/En/index.aspx

[2] Shen Sunan, Ruan Qingyuan, Yuan Yan, Ma Jun, Blue Sky Roadmap Phase IV Report, August 2016, pp.65-66

[3] Shen Sunan, Ruan Qingyuan, Yuan Yan, Ma Jun, Blue Sky Roadmap Phase IV Report, August 2016, pp.66

REFERENCES

Booz, A. (1991). and Hamilton. Hope for the future, Special Advertising Section. *Business Week*, Dec. 30, pp. 83.

Chang, Dunhu, Hairong, An, Xin, Wang The Complexity of Environmental Issue and the Expansion of Public Participation. *Chinese Population, Resources and Environment*, (4): 131-133, 2004.

Chen, G. (1996). *Discussion on Environmental Warning* Chongqing Environmental Science.

China Water Conservancy Newspaper.. (2001). *Shanghai Mother River*, No.5.

Fischer, K., Schot, J. (1993). *Environmental Strategies for Industry: International Perspective on Research Needs and Policy Implications.* Washington, DC: Island Press.

Free, J.H.A. (2001). A New Approach to Environmental Protection. *Harv. J. Law Public Policy,* 24.

Hanson, D. (1993). Toxic Release Inventory: Firms Make Strides in Cutting Emissions. *Chem. Eng. News,* (May), 31.
[http://dx.doi.org/10.1021/cen-v071n024.p031]

Hong, W., Luo, Y. (2006). Establish Rational Ecological Man to Construct the Harmonious Society. *China Bus. Rev, 1*(5), 30-35.

Jian, P., Zhou, S. (2001). *Public Environmental Sensation Environmental Awareness Establishment—Take the Investigation of Nan Sha River Environmental Awareness in Beijing for Example* The Humanities and Geography.

Koontz, T. M. (2006). Collaboration for Sustainability? A Framework for Analyzing Government Impacts in Collaborative Environmental Management. Sustainability: Science. Practice and Policy. No. 2, pp: 15-24.

Lan, L. (2005). Legalization of Corporate Environmental Responsibility in the Cycle Economic Model, Master Thesis. Beijing: China University of Political Science and Law.

Li, A., Zhou, Z., Lin, G. (2008). *Environmental Impact Assessment Technical Guide.* China Machine Press.

Li, Junyang (2007). Suzhou River and National Industry. *Project Report*.

Li, L., Fan, W., Zhang, W. (2004). *E-government and the Construction of Environmental Information* Chinese Environmental Manager College Journal.

Lindhqvis, T. (1998). What Is Extended Producer Responsibility?

Liu, Hongmei, Wang, Keqiang (2006). The Public Participation in the Environmental Protection Research

Review. Gansu Social Science, No. 4, pp :28-48.

Liu, Z. (2005). Implement ISO14001 and Build Corporate Green Culture, Master Thesis. Tianjin: Tianjin Science and Technology University.

Na, Tong (2006). Running for the International Standard of Environmental Protection. Economic Daily, December 19.

Post, J.E., Altman, B.W. (1992). Models of Corporate Greening: How Corporate Social Policy and Organizational Learning Inform Leading-Edge Environmental Management. *Research in Corporate Social Performance and Policy, 23*, 3-29.

Qi, Z., Xu, F., Yi, S. (2004). The Current and Future of Chinese Environmental Information System. *Forum (Genova).*

Qiang, Z., Tang, D. (2002). *Culture: the Fate of the Artist's Warehouse.* Southern Weekend.

Qu, Geping (2005). The Public Participation and Social Adjustment in Environmental Protection. Chinese Environmental Newspaper, May 17, pp: 3.

Shi, J. (2010). *Chen Kangli, Urban Environmental Security.* Chemical Industry Press.

Sun, Z. (2002). *Protection and Improvement of Citizen Environmental Right* Inner Mongolia Technology and Economy.

Tao, Hong (2001). Suzhou River, Chinese First Polluted River Reborn. *Shanghai Standardization*, (5): 20-22.

Wang, J., Chen, J. (2005). *Contemporary Environmental Management System Construction.* China Environmental Science Press.

Wang, L., Zhang, Q. (2005). On the Administrative Separation Influence on the Environment *Proceeding of the Sixth Annual Meeting and Academic Seminar of Fudan University,* Environmental Economics Research Center..

Wei, Z. (2001). *Publication of Environmental Information and Explanation of its System* Yunmeng Journal.

Wu, W. (2007). *The Control Model to Improve the Execution of Middle Level Managers.* Enterprise Research.

Ying, X. (2007). Effect Analysis of Government Environmental Regulation and Public Participation on Enterprise Pollution Behavior, Doctorate Thesis of Nanjing Agricultural University, pp: 20.

Yong, Qian (2004). On the Extended Producer Responsibility Policy of OECD Countries and its Effect on the Market Structure and Firm Conduct. *Industrial Economic Research*, No.2, pp: 9-18.

Yu, Q. (2001). *Environmental Management Standardization Theory and Method—Guide for Corporate Implementation of ISO14001.* Beijing: Capital Economic and Trade University Press.

Zhang, J. (2005). On Environmental Information Publication, *Henan. Soc. Sci. (Kans.),* 30-31.

Zhang, X., Bin, L. (2005). On the Extended Producer Responsibility Principle and the Function in Recycling Economics, *China Population. Resources and Environment, 15*(2), 19-22.

CHAPTER 10

Concise Views: Conclusion and Prospect

Abstract: From the perspective of SDS, we can examine the historic background and theoretical basis of CER in a holistic manner. Through comparison and empirical study, we can learn the better notion and measures of CER. China's sustainable development is deep-rooted and moving forward. The government laws and regulations of advanced countries, entrepreneurial spirit and corporate culture, and enterprises self-regulation is significant in the entire enterprise system. When learning from others, Chinese enterprises should develop the ecological wisdom of "heaven-man-harmony". Although China has made certain achievement in CER, various problems can be found in reality. Chinese enterprise managers have some bias of CSR. In CSR strategy and corresponding management system building, the state-owned enterprises are not mature enough. The small and medium sized enterprises pay less attention to environmental protection. Sometimes government neglects environmental responsibility. The public participation and supervision ability is not strong enough. The trinity and collaboration of government, enterprises and the public—extended producer responsibility, industrial structure upgrade and environmental e-government construction; ISO 14000 system strategy, environmental culture building; simple consumption, social service and nongovernment involvement—will promote China's CER practice from passively to actively. Due to the limit of time, energy and capability, there are some questions needed to be reflected in this research. How to carry out extended producer responsibility? How effective are the key indicators of CER in real work situation? And the number of questionnaire investigation is inadequate. To get profit through strategy of social value will also be the future concern.

Keywords: Corporate environmental responsibility (CER), Corporate social responsibility (CSR), Enterprises, Government, System and Dialectical Science (SDS), The public.

This book explains the basic theory and evolution of corporate social responsibility. And it analyses the features of corporate environmental responsibility. It also demonstrates the successful cases of national and international corporate environmental responsibility practice and points out the problems and causes of China's environmental pollution. On the basis systematic science analysis, it explores the countermeasures to improve corporate environmental responsibility in China. The research on these issues is systematic, and the combination of qualitative and quantitative analysis has been used to

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reach the target of planning. However, some inadequacies need to be further improved.

1. MAIN CONTRIBUTION

SDS is the perspective of this research. The basic views of SDS are systematic view, progressive view and time and space view. The fundamental laws are the organization-emerging law, difference cooperating law, structural and functional law, class transferring law and integrity improving law. Based on the perspective of SDS, we can examine the historic background and theoretical basis of CER emergence and development in a holistic manner. Through comparison and empirical study, we can recognize the characteristics of Chinese enterprises and learn from the sustainable development notion and measures of developed countries. The cluster analysis and factor analysis are the effective complement of SDS methods. The quantitative research on the basis of qualitative analysis reflects the difference cooperating law and integrity improving law. It also provides the support for the target and focus of business environmental management.

In 2008, invited by Professor David Crowther, the first CSR professor in the world, the author attended the 7th International Conference of Corporate Social Responsibility in Durham. The conference paper "Corporate Environmental Responsibility From the Perspective of Systematic and Dialectical Science" was edited in "A Handbook of Corporate Governance and Social Responsibility" by Gower Publishing Limited in 2010.

Based on the pyramid model of CSR, the author further thinking resulted in the recent paper, "Systematic Analysis of Corporate Environmental Responsibility: Elements, Structure, Function, and Principles", which was published in "Chinese Journal of Population Resources and Environment" in 2016[1].

China's sustainable development is deep-rooted and can obtain help from other countries. The constraints of government laws and regulations of advanced countries, entrepreneurial spirit and corporate culture, and enterprises self regulation play an important role in promoting environmental management improvement of the entire enterprise system. When learning from others, Chinese enterprises should develop the ecological wisdom of "heaven-man-harmony", avoid recommit the same error, and use suitable measures to achieve economic development and environmental protection. China has made certain achievement in CER. However, we can find some problems in reality. Chinese enterprise managers have some bias awareness of CSR. In CSR strategy and corresponding management system building, the state-owned enterprises are not mature enough. The small and medium sized enterprises pay less attention to environmental

protection. Sometimes government neglects environmental responsibility. The public participation and supervision ability is not strong enough. The trinity and collaboration of government, enterprises and the public—extended producer responsibility, industrial structure upgrade and environmental e-government construction; ISO 14000 system strategy, environmental culture building; simple consumption, social service and cooperation education—will promote China's CER practice from passively to actively.

2. CONCLUDING REMARKS

21st century is the environmental century. This book is hoped to help the academia, business managers, government leaders and the public in corporate environmental responsibility research and practice.

From the angle of researchers, the SDS perspective is different from previous economics, sociology, law and ethics perspectives. Generally speaking, CER study from different perspectives all aims to illustrate the interaction between these perspectives and environmental systems. The unity of purpose made these researches have some similarities. Meanwhile, different perspective or innovative idea is caused by different standing point.

Firstly, the economic perspective is to study various relationships between human behavior and environmental quality. The essence is to study how the incentive mechanism of the economic system destroy or protect the environment. The key is to determine the cost and benefit of the environment quality improvement, especially those hidden cost and benefit. In other words, the economic issues analysis, such as cost and benefit, supply and demand, efficiency and equality, is to illustrate that people measure the environment value, based on which brings the injury degree and identify the motivation of people who take different actions on the natural environment, and how to reconstruct a new system to change harmful environment behavior. What the difference that SDS makes is that this book analyze the systematic interaction among government, business and the public.

Secondly, CSR can be elaborated more macroscopically from the sociological perspective. Max Weber, Pareto and Parsons, the famous sociologist, have established excellent theoretical achievement in social behavior and its interaction and constraint regulation. However, few research is conducted on the topic of CER. In the society and environment aspect of the book "General Sociological Theory" (Pang, 2009), the geographic location, climate, resources, natural environment evaluation divergence and man-nature statement are stated. But there is much more qualitative description than quantitative analysis. In August 2008, Hu Shensheng, Professor of Shanghai University Sociology Department mentioned in media about the environment policy of "extended producer

responsibility", but it was only the concept introduction. Differently, this book intends to focus on the enterprise entity from the philosophy of SDS.

Thirdly, the perspective of ethics is mainly used to solve environmental problems in the moral way. With the launching of the environmental movement, many people concern about the environmental ethics and explore the human moral standard influence on the natural environment. However, it is not clearly enough to emphasize on environmental ethics. One major reason is that the environment issue not only relates to a country but also the entire human survival and development, it is not simply a personal thing. Meanwhile, there are some problems when ethics are used as the primary means of fighting pollution. Firstly, people may not have ready-made possible ethical standards and the urgency of environmental problems cannot allow us to spend a long time to wait for the moral reconstruction. Secondly, in reality, apart from environmental protection, some other social goals also involve moral elements, such as the housing, health care, education, security, *etc*. The conflict of various objectives often makes us too busy to attend the moral aspect and have to worry about the more practical issues: the correctness of environmental objectives and measures, the best use of the fund, *etc*. These problems have been specifically discussed in this book from SDS perspectives, which have practical value of problem solution.

Finally, from the law perspective, China's laws to regulate corporate behavior includes "State-owned Enterprise Law", "Township Enterprise Law", "Partnership Law", "Individual-owned Enterprise Law" and "Wage Law", *etc*. The 5th article of the newly revised "Company Law" in 2005 firstly put forward the concept for company to take social responsibility, but it did not have clear definition on how to supervise company to take social responsibility (Wang, 2011). Therefore, to make up the law deficiency and intensify law enforcement is the target of law perspective. And the goal of SDS is more than that. Systematically, it can help us study the economic, social, legal or ethical aspects of CER, which received little attention previously. And it can benefit the following government leaders, business managers and the public to meet the current climate change challenge.

From the angle of government leaders, it is significant to make institution arrangements for low-carbon economy. In order to reduce greenhouse gas emission, institutional factors such as policy and government actions are important measures. These measures may include allocating resources through economic means, improving relevant laws and regulations, adjusting industrial structure, motivating the public to participate in a wide range of actions to address climate change. Learning from the successful experience of Germany government in waste management, Chinese government can carry out the following specific

measures: First, accelerate formulating and revising relevant regulations of energy production and conversation. Second, improve energy-saving regulations and standards. The supporting regulations are Petroleum-saving Management Regulation, Building Energy-saving Management Regulation and Electricity-saving Management Regulation, *etc*. The energy efficiency standards are for the main energy used in industrial equipment, domestic appliances, light applicants and motor vehicles. Third, strength the establishment and implementation of laws and regulations. Forth, strengthen the implementation of relevant laws and regulations on municipal wastes. The local government will focus on Law on Prevention of Environmental Pollution Caused by Solid Waste of the People's Republic of China, Measures for the Management of Municipal Domestic Waste and Regulations on the Management of City Appearance and Sanitation. And the governance will be shifted from the current end-focused management to whole process-focused management. For example, recovery and utilization, non-hazardous disposal and reduction of waste from the source. According to the evolving requirement, compulsory standards for waste classification and recovery shall be formulated. The current standards such as Standards for the Classification and Assessment of Municipal Domestic Wastes, Technical Norms on Sanitary Landfill of Domestic Wastes, Standards for the Assessment of Non-hazardous Landfill of Domestic Wastes, will be implemented more strictly and further revised, with the aim to improve the recovery and utilization of combustible gas from the landfills and to reduce the emissions of methane from landfills. In a word, the government takes an important role in ensuring legal system and compliance, halting the inefficient extraction of natural resources, improving the quality of product standards and attain energy security to promote a "harmonious society".

From the angle of business managers, it is important to set up the mission of stakeholder-oriented sustainability strategy. In an excellent sustainability management system, the managers can integrate and comply with applicable laws and regulations. The continuously enhanced communication with stakeholders will promote a harmonious business ecosystem and contribute to the society. In particular, the environmental protection promotion will include the following actions: incorporating green concepts into product planning, design, R&D, manufacturing, delivery and service procedures. Through continuous technological innovation, the resource utilization efficiency is optimized to provide customers with green, energy-efficient products and solutions. Also the supply chain will be required to operate in compliance with green regulations so as to promote energy conservation and emission reduction. And the employees are provided with good training of ISO26000 system skills and business ethics to prevent operating risks and develop healthy relationship with the partners, communities, investors, shareholders, government, industry associations, banks,

media, research institute, charitable groups and NGOs. Therefore, when the stakeholder orientated strategy is integrated into day-to-day operation and corporate culture, the business managers can ensure the sustainability management and respond to critical issues.

From the angle of the public, the environment awareness and participation are the key words. China has experienced tremendous economic development over the past 30 years. However, Chinese people has suffered from the serious environmental destruction at the same time. The amelioration of environmental issues requires the public to exercise their environmental right to know as well as their right to take part in and oversee the environmental protection. The public can choose products of companies with superior environmental performance, and forsake highly polluting industries. To create a better tomorrow for their families and children, investors can choose environmentally friendly enterprises when making financial decisions or investment. NGOs can be an effective environmental information source. As is shown in Chapter 9, Chinese IPE has aided enterprises in using information disclosure and extensive emission reductions to improve brand image and business competitiveness, and has helped the government further information disclosure and expand public assess and understanding of information and promote wider public supervision of enterprises' emission reduction. There will be many other things that the public can help with corporate environmental responsibility. For example, NGO can develop the corporate information transparency index, urging suppliers to reduce emissions through pressure and driving the performance of green supply chains. In addition, with the leverage of investment and finance, green stocks and green credit projects can be established to urge polluting enterprises to improve their environmental performance.

3. LIMITATIONS AND PROSPECT

Encountering the global environmental and ecological crisis, many countries around the world are actively engaging in the problems through various ways. In our country, the construction of ecological civilization and the sustainable development was put on the agenda since 2002.

China's industrial development under the binding of resource and environment is more obvious as compared with other countries in the world. Population and natural resources are not absolutely obstacles to China's industrial development, and China's resource circumstance has its relative advantages, especially in the way of total volume and variety. However, China is not a country with rich resources. Large population and low capita of resources are basic circumstances. With the current serious environmental problem, the constant haze, China's

enterprises are more aware to take the corporate environmental responsibility.

CER is of paramount importance to build harmonious society in China. Due to the limit of time, energy and capability, there are at least three aspects need to be improved in this research.

Firstly, some important issues, such as how to build environmental enterprises, how to cover environmental information and how to carry out extended producers responsibility, *etc*. remains to be studied specifically.

Secondly, the main content of this book is based on the qualitative research. More quantitative research need to be done on some practical issues which closely related to the theme. For example, the key indicators of CER need to be implemented and tested in real work situation, the main index of corporate low carbon responsibility to cope with climate change, *etc*.

Thirdly, the empirical study of heterogeneous enterprises does not classify the industry. Different environmental influences caused by different industries should be analyzed specifically. And the amount of questionnaire respondents need to be extended.

Recently, more and more companies are learning to gain business benefits from strategies that have wider social values. How to participate in solving social problems, such as smog and water pollution, based on the company's main business, is the CER research, which needs to be explored innovatively.

The above limitations are the tasks of my future research. I will try my best to continue to improve the Research on Corporate Environmental Responsibility.

NOTES

[1] (http://dx.doi.org/10.1080/10042857.2016.1147715)

Bibliography

Adams, C.A., Hill, W-Y., Roberts, C.B. (1998). Corporate Social Reporting Practices in Western Europe: Legitimising Corporate Behaviour? *British Accounting Review, 30*(1), 1-21. [http://dx.doi.org/10.1006/bare.1997.0060]

Air Cargo World. (2010). http://web.ebscohost.com/ehost/detail?vid=9 &hid=122&sid=2840b289-1fe8-42-a-al...14/10/2011

Allaire, P. (1990). A Message from the CEO, *Xerox Corporation and the Environment*.

Altman, W. (2009). Carbon Consultant, *Engineering and Technology*, pp: 76-79.

American Electronics Association. (1992). The Hows and Whys of Design for the Environment, *A Primer for Members of the Electronics Association*, pp: 3.

Anderson, K., Bows, A. (2008). Reframing the climate change challenge in light of post-2000 emission trends, *Philosophical Transactions A*, 366(1882), 3863.

Aras, G., Crowther, D. (2012). *Governance and Social Responsibility.* UK: Palgrave Macmillan. [http://dx.doi.org/10.1007/ 978-0-230-34463-1]

Armstrong, S.J., Botzier, R.G. ((ed.), Environmental Ethics: Divergence and Convergence, New York: McGraw-Hill, pp: 3821993.).

Ashforth, B.E., Gibbs, B.W. (1990). The Double Edge of Legitimization. *Organization Science, 1*, 177-194. [http://dx.doi.org/10.1287/orsc.1.2.177]

Azar, J. (1993). *An interview with Azar.*

Barnaby, J.F. (2004). Funds Want Oil Companies to Report on Climate, *New York Times* (February 27), C3.

Baskin, Y. (1997). *The Work of Nature: How the Diversity of Life Sustains Us.* Washington, DC: Island Press.

Baumol, W.J., Oates, W.E. (1988). *The Theory of Environmental Policy* (2nd ed.). Cambridge: Cambridge University Press. [http://dx.doi.org/10.1017/CBO9781139173513]

Bei, Jin (2005). China's Industrial Development under the Binding of Resources and Environment, China Industrial Economy, April, No. 4.

Bei, T. (2006). *Beijing Tong Ren Tang: Sialon Replacing Tiger Bone, Protecting the Environment and Curing Rheumatism, Responsibility Competitiveness.* Beijing: Business Management Press.

Benchmark. (1991). Xerox and Environment, A Quarterly Magazine for Xerox Customers, pp: 2.

Birch, C. (1975). *Confronting the Future: Australia and the World: The Next Hundred Years.* Harmondsworth: Penguin.

Bonardi, J.P., Keim, G.D. (2005). Corporate political strategies for widely salient issues. *Academy of Management Review, 30*(3), 555-576.

[http://dx.doi.org/10.5465/amr.2005.17293705]

Booz, A. (1991). Hope for the future, Special Advertising Section, Business Week, Dec. 30, pp: 83.

Bowen, H.R. (1953). *Social Responsibilities of the Businessman.* New York: New York University Press.

Boaxia, Z. (1995). More Punishment to Controll the Acid Rain, China Daily.

Boyden, S., Dovers, S., Shirlow, M. (1990). *Our Biosphere under Threat: Ecological Realities and Australia's Opportunities.* Melbourne: Oxford University Press.

Brown, L.R. (1984). *State of the World Reports.* New York: W.W. Norton.

Buchholtz, A.K., Carroll, A.B. (2008). *Business and Society.* Canada: Cengage Learning.

Buhr, N. (1998). Environmental Performance, Legislation and Annual Report Disclosure: the Case of Acid Rain and Falconbridge. *Accounting, Auditing and Accountability Journal, 11*(2), 163-190.
[http://dx.doi.org/10.1108/09513579810215455]

Business Week. (1998). Good Works and Great Profits, February 16, pp. 8.

Carroll, A.B. (1979). A Three-dimensional Conceptual Model of Corporate Social Performance. *Academy of Management Review, 4*, 497-505.
[http://dx.doi.org/10.5465/amr.1979.4498296]

Carroll, A.B. (1991). The Pyramid of Corporate Social Responsibility: Toward the Moral Management of Organizational Stakeholders. *Business Horizons, 34*, 42-56.
[http://dx.doi.org/10.1016/0007-6813(91)90005-G]

Carroll, A.B. (1999). Corporate Social Responsibility. *Business society, 38*(3), 268-295.
[http://dx.doi.org/10.1177/000765039903800303]

Carroll, A.B. (2008). A History of Corporate Social Responsibility: Concepts and Practices.*The Oxford Handbook of Corporate Social Responsibility* (pp. 19-46). Oxford: Oxford University Press.

Carson, R. (1962). *Silent Spring.* New York: Fawcet Crest Books.

Chang, Dunhu (2004). An Hairong, Wang Xin, The Complexity of Environmental Issue and the Expansion of Public Participation, *Chinese Population, Resources and Environment*, (4):131-133.

Charle, S. (2007). *Strategy and Business: When Addressing Climate Change is Good business.*

Cheng, L. The Concept Definition of Corporate Social Responsibility, *Shanghai Normal University Journal* (Philosophy and Social Sciences edition), Vol.5, 2006.

Chen, G. (1996). Discussion on Environmental Warning. *Chongqing Environmental Science,* 18.

Chen, G., Lei, Z. (2006). *Definition of Corporate Social Responsibility, Chinese Corporate Social Responsibility Report* (p. 17). Beijing: China Financial and Economic Press.

Chen, Y. (2005). On the Corporate Social Responsibility. *Chongqing Science and Technology College Journal (Social Sciences edition).*

Chen, Y. (2005). www.stats.gov.cn

China Water Conservancy Newspaper. (2001). *Shanghai Mother River.*

Chinese Academy of Engineering. (2000). *On China's Sustainable Development Strategy of Water Resources Comprehensive Report*.

Clarkson, M.B.E. (1995). A Stakeholder Framework for Analyzing and Evaluating Corporate Social Performance. *Academy of Management Review, 20*, 92-117.
[http://dx.doi.org/10.5465/amr.1995.9503271994]

Coase, R.H. (1960). The Problem of Social Cost. *Journal of Law and Economics. 1*(15).

Coase, R.H. (1988). *The firm, the market and the law.* Chicago: University of Chicago Press.

Coffman, J. (2007). *Leading Global Business Strategies Map US Global Warming Solutions.*

Committee for Economic Development (CED). (1971). *Social responsibilities of business corporations.* New York: Author.

Commoner, B. (1972). *The Closing Circle.* Toronto: Bantam.

Cools, K. (2007). Chemical Week, January 31, pp: 28.

Dahlman, C.J. (1979). The Problem of Externality. *Journal of Law and Economics, 22*(l), 141.
[http://dx.doi.org/10.1086/466936]

Daily, G. (1997). *Nature's Services: Societal Dependence on Natural Ecosystems.* Washington, DC: Island Press.

David, C. (2003). Intra- and Intersectoral Effects in Environmental Disclosures: Evidence for Legitimacy Theory? *Business Strategy and the Environment, 12*, 357-371.
[http://dx.doi.org/10.1002/bse.375]

Davis, K. (1960). Can Business Afford to Ignore Social Responsibilities? *California Management Review, 2*, 70-76.
[http://dx.doi.org/10.2307/41166246]

Davis, K. (1967). Understanding the Social Responsibility Puzzle: What Does the Business Owe to Society? *Business Horizons, 10*, 45-50.
[http://dx.doi.org/10.1016/0007-6813(67)90007-9]

Davis, K. (1973). The Case for and against Business Assumption of Social Responsibilities. *Academy of Management Review, 16*, 312-322.

Daxiayingzhi, Wu Yaoming. (2005). Soichiro Honda Legend, Hangzhou: Zhejiang Renming Press.

Deegan, C., Gordon, B. (1996). A Study of the Environmental Disclosure Policies of Australian Corporations. *Accounting Business Research, 26*(3), 187-199.
[http://dx.doi.org/10.1080/00014788.1996.9729510]

Deegan, C., Rankin, M. (1996). Do Australian Companies Report Environmental News Objectively? *Accounting, Auditing and Accountability Journal, 9*(2), 50-67.
[http://dx.doi.org/10.1108/09513579610116358]

Deegan, C., Rankin, M. (1997). The Materiality of Environmental Information to Users of Annual Reports.

Accounting, Auditing and Accountability Journal, 10(4), 562-583. [http://dx.doi.org/10.1108/09513579710367485]

Dillon, P.S., Kurt Fishcher, K. (1992). *Environmental Management in Corporations: Methods and Motivations.* Medford, MA: Tufts University Certer for Environmental Management.

Dowling, J., Pfeffer, J. (1975). Organizational Legitimacy: Societal Values and Organizational Behaviour. *Pacific Social Review, 18*(1), 122-136. [http://dx.doi.org/10.2307/1388226]

Drucker, P.F. (1984). The New Meaning of Corporate Social Responsibility. *California Management Review, 26*, 53-63. [http://dx.doi.org/10.2307/41165066]

Drucker, P.F. (2002). *Zhang Wei translated, Innovation and Entrepreneurship.* Shanghai: Shanghai Renmin Press.

Drucker, P.F. (2006). *The Practice of Management.* New York: Collins.

Eells, R., Walton, C. (1974). *Conceptual Foundations of Business* (3rd ed.). Burr Ridge, IL: Irwin.

Ehrlich, P., Ehrlich, A. (1990). *The Population Explosion.* London: Hutchinson.

Elsbach, K. (1994). Managing Organizational Legitimacy in the California Cattle Industry: the Construction and Effectiveness of Verbal Accounts. *Adm. Sci. Q, 39*(1), 57-89. [http://dx.doi.org/10.2307/2393494]

Elsbach, K., Sutton, R.I. (1992). Acquiring Organizational Legitimacy Through Illegitimate Actions: a Marriage of Institutional and Impression Management Theories. *Academy of Management Review, 35*, 699-738.

Epstein, E.M. (1987). The Corporate Social Policy Process: Beyond Business Ethics, Corporate Social Responsibility, and Corporate Social Responsiveness. *California Management Review, 29*, 99-114. [http://dx.doi.org/10.2307/41165254]

Evan, W., Freeman, R. (1993). A Stakeholder Theory of the Modern Corporation: Kantian Capitalism.*Ethical Theory and Business* (pp. 166-171). Englewood Cliffs, NJ: Prentice-Hall.

*Facilities management Energy.*www.worksmanagement.co.uk

Fan, Z. (2005). *On the Corporate Social Responsibility in the Transitional Economy*. Hunan Science and Technology College Journal.

Federal Register. (1992). Vol. 57, No. 27.

Feng, J. (2010). *EU Energy Strategy: Towards a Low-carbon Economy.* Beijing: Shishi Press.

Feng, Z. (2004). *Circular Economy Introduction* (pp. 18-20). Beijing: Renming Press.

Feng, Zhijun (2007). Normalization Theory Study on Circular Economy, China Population, Resources and Environment, Vol. 17, No. 4, pp. 10,11.

Fischer, K., Schot, J. (1993). *Environmental Strategies for Industry: International Perspective on Research Needs and Policy Implications.* Washington, DC: Island Press.

Food and Drink Technology. (2007). Happy Hens Lay Low Carbon Eggs.

Frederick, W.C. (1960). The Growing Concern Over Business Responsibility. *California Management Review, 1*, 38-46.

Free, J.H.A. (2001). A New Approach to Environmental Protection. *Harv. J. Law Public Policy,* 24.

Freeman, R.E. (1984). *Strategic Management: A Stakeholder Approach.* Boston, MA: Pitman.

Gang, X., Dong, Y. (2005). The Inspiration and Reference of Germany's Development of Circular Economy, *JiangSu, Science*. *Technology and Economics, 18*(1), 41-43.

Gary, O. (2002). Environmental Disclosures in the Annual Report: Extending the Applicability and Predictive Power of Legitimacy Theory. *Accounting, Auditing and Accountability Journal, 15*(3), 344-371. [http://dx.doi.org/10.1108/09513570210435870]

Gauthier, D. (1990). *Moral Dealing: Contract, Ethics, and Reason.*

G8. (2009). *Declaration of the Leaders of the Major Economies Forum on Energy and Climate.*www.g8italia2009.it/static/G8 Allegato/MEF Declarationl.pdf

Greeno, J.L. (1994). Corporate Environmental Excellence and Stewardship.*Environmental Strategies Handbook: A Guide to Effective Policies and Practices* (pp. 43-64). New York: McGraw-Hill.

Greenspan, R.G.B. (2001). *Dai Xingyi et al*. translated, Hot Planet: Climate Crisis, to Cover up the Truth or Seek Countermeasures Shanghai Translation Press.

Groner, S., Zapf, M. (1998). Unternehmen, Stakeholder und Umweltschutz (Companies, Stakeholders and Environmental Protection). *UmwelfWirtschaftsForum, 3*, 52-57.

Gui, Y., Fu, T. (2000). *The City Water Supply Situation and Characteristics of China.*

Guo, X. (2001). Environmental Accounting—Integrating Environmental Element into Management Decisions, PhD thesis, Fujian: Xiamen University.

Hagen, K. (2007). How Global Warming Affects your Business Strategy, December 21, p. 2.

Hansen, J., Sato, M., Ruedy, R., Kharecha, P., Lacis, A., Miller, R. (2006). Dangerous Humanmade Interference with Climate: A GISS ModelE Study. *Atmos. Chem. Phys, 7*, 2287-2312. [http://dx.doi.org/10.5194/acp-7-2287-2007]

Hanson, D. (1993). Toxic Release Inventory: Firms Make Strides in Cutting Emissions. *Chemical Engineering News,* (May), 31. [http://dx.doi.org/10.1021/cen-v071n024.p031]

Hart, S.L. (1995). A Natural-Resource-Based View of the Firm. *Academy of Management Review, 20*(4), 986-1014. [http://dx.doi.org/10.5465/amr.1995.9512280033]

Hartwig, D., Meyerholt, U. (1994). Die Entwicklung des Abfallrechts von der Beseitigung zur Kreislaufwirtschaft, Entwicklungen und Probleme der Abfallwirtschaft vor dem Hintergrund des geplanten Gesetzes zur Vermeidung won Ruckstanden, Verwertung von Sekundarrohstoffen und Entsorgung von Abfallen, Fachbereich Wirtschafts-und Sozialwissenschaften: Arbeitsberichte, 129, Luneburg: Universitat Luneburg, pp: 2-9.

Harvey, F. (2007). *Winds of Change Beginning to Blow.* http://www.ceres.org

Hegel. (1957). Lectures on the History of Philosophy, Beijing: Commercial Press.

Henriques, I., Sadorsky, P. (1999). The Relationship Between Environmental Commitment and Managerial Perceptions of Stakeholder Importance. *Academy of Management Review, 42*(1), 87-99.

He, Zuoxiu, Wang, Yinan (2004). Special Attention: Attention to the Tertiary Industry Energy Efficiency, *Economic Daily*, April 28th.

Hong, T. (2006). *Corporate Social Responsibility Promotion and its Mechanism* Economic Management Publishing House.

Hong, W. (2009). *Corporate Environmental Responsibility Research.* Beijing: Economic and Management Press.

Hong, W. (2011). Study on the Low Carbon Responsibility Index of CNPC. *Proceedings of the 1st Corporate Governance Conference,* 200-209.

Hong, W., Luo, Y. (2006). Establish Rational Ecological Man to Construct the Harmonious Society. *China Bus. Rev, 1*(5), 30-35.

Hu, A. (2004). *China in the World Economy: Domestic Policy Challenges*.

Hua, Y., Bo, X. (2005). *China's Electronic Waste Recycling Processing Industrialization Problem and Countermeasure, Sustainable Development Economics and Environment* (p. 346). Shanghai: Tongji University.

Huang, H., Liu, J. (2007). *Germany Circular Economy Research* (pp. 50-55). Beijing: Science Press.

Huining, H. (2005). Corporate Social Responsibility Construction. *Revolution.*

Ica, R. (2001). From Red to Green: Towards the Environmental Management in the Country in Transition. *J. Bus. Ethics, 33*, 37-50.
[http://dx.doi.org/10.1023/A:1011977116496]

Intergovernment Panel on Climate Chang (IPCC). (1995). *Climate Change* Cambridge University Press.

IPCC. (2007). *Climate Change 2007: Synthesis Report.* Cambridge, UK: Cambridge University Press. a

Jackson, M.C. (1991). *Systems Methodology for Management Sciences.* New York: Plenum.
[http://dx.doi.org/10.1007/978-1-4899-2632-6]

Jia, L. (2003). Externalities Theory and the Policy Boundary, South China Normal University Doctor Degree Thesis.

Jian, P., Zhou, S. (2001). *Public Environmental Sensation Environmental Awareness Establishment—Take the Investigation of Nan Sha River Environmental Awareness in Beijing for Example* The Humanities and Geography.

Jie, W. (2003). *Systematic and Dialectical Science* (p. 3). Beijing: People Press.

Jie, Wang, Yang, Lianmin (2004). The Energy Efficiency is Only 3% in Our Country, *Chinese Industrial and Commercial Times*, Sept. 17th.

Jin, S. (2007). Profit: Low Carbon Economy Growth. *World Environment, 4*, 32-34.

Johnson, H.L. (1971). *Business in Contemporary Society: Framework and Issues.* Belmont, CA: Wadsworth.

Johnston, D., Lowe, R., Bell, M. (2005). An Exploration of the Technical Feasibility of Achieving CO_2 Emission Reduction Excess of 60% Within the UK Housing Stock by the Year 2050. *Energy Policy, 33*, 1643-1659.
[http://dx.doi.org/10.1016/j.enpol.2004.02.003]

Jones, T.M. (1980). Corporate Social Responsibility Revisited, Redefined. *California Management Review,* 59-67.
[http://dx.doi.org/10.2307/41164877]

Jones, T.M. (1995). Instrumental Stakeholder Theory. *Academy of Management Review, 20*(2), 37-404.
[http://dx.doi.org/10.5465/amr.1995.9507312924]

Kai, Z. (2004). Discussion on Circular Economy Theory, *China Population*. *Resources and Environment, 14*(6), 48.

Kawase, R., Matsuoka, Y., Fujino, J. (2006). Decomposition Analysis of CO_2 Emission in Long-term Climate Stabilization Scenarios. *Energy Policy, 34*, 2113-2122.
[http://dx.doi.org/10.1016/j.enpol.2005.02.005]

Kennedy, P. (1993). *Preparing for the Twenty-First Century.* New York: Random House.

Keys, P. (1991). *Operational Research and Systems: The Systemic Nature of Operational Research.* New York: Plenum.
[http://dx.doi.org/10.1007/978-1-4899-0667-0]

Kolk, A., Leby, D. (2004). Multinationals and Global Climate Change: Issue for the Automotive and Oil Industries.*Multinations, Environment and Global Competition* (Vol. Vol. 9, pp. 171-193). Amsterdam: Elsevier.
[http://dx.doi.org/10.1016/S1064-4857(03)09008-9]

Koontz, T. M. (2006). Collaboration for Sustainability? A Framework for Analyzing Government Impacts in Collaborative Environmental Management, *Sustainability: Science, Practice and Policy*, (2): 15-24.

Kotler, P. (2006). *(Jiang Wenbo et al.* translated), Corporate Social Responsibility: Expanding More Business Opportunities Through Public Welfare. Beijing: Mechanical Industry Press.

Lash, J., Wellington, F. (2007). *Competitive Advantage on a Warming Plant, Harvard Business Review on Green Business Strategy.* U.S.: Harvard Business School Publishing Corporation.

Laszlo, E. (1997). *Li Yinbo et al*. translated, Fateful Choice: a Choice to Survive the 21st Century, Life Reading and New Knowledge Joint Publishing House.

Lawrence, A.T., Morell, D. (1995). Leading-Edge Environmental Management: Motivation, Opportunity, Resources, and Processes. *Research in Corporate Social Performance and Policy,* (Suppl. 1), 99-127.

Lawton, J.H., May, R.M. (1995). *Extinction Rates.* Oxford University Press.

Lee, M.P. (2008). A Review of the Theories of Corporate Social Responsibility: Its Evolutionary Path and the Road Ahead. *Int. J. Manag. Rev, 10*, 53-73.

[http://dx.doi.org/10.1111/j.1468-2370.2007.00226.x]

Lehman, C. (1983). *Stalemate in Corporate Social Responsibility Research.*

Levy, D.L., Kolk, A. (2002). Strategic Responses to Global Climate Change: Conflicting Pressures on Multinationals in the Oil Industry. *Bus. Polit, 4*(3), 275-300.
[http://dx.doi.org/10.2202/1469-3569.1042]

Li, Junyang (2007). Suzhou River and National Industry, Project Report, December.

Li, H. (2007). *Enterprises Fulfilling Social Responsibility is Firstly to Enhance the Image, Why They Do Not Fulfill Their Social Responsibilities.* Enterprise Management Research.

Li, L., Fan, W., Zhang, W. (2004). *E-government and the Construction of Environmental Information* Chinese Environmental Manager College Journal.

Lindhqvis, T. (1998). What Is Extended Producer Responsibility?

Liu, Hongmei, Wang, Keqiang (2006). The Public Participation in the Environmental Protection Research Review, *Gansu*. *Soc. Sci. (Kans.),* (4), 28-48.

Lan, L. (2005). *Legalization of Corporate Environmental Responsibility in the Cycle Economic Model.*

Liu, Z. (2005). *Implement ISO14001 and Build Corporate Green Culture.*

Lu, C., Zheng, W. (2006). *Corporate Social Responsibility Essence: Explanation on the Basis of Resources Allocation Efficiency, Chinese Corporate Social Responsibility Report* (p. 93). Beijing: China Financial and Economic Press.

Lindblom, C.K. (1994). The Implications of Organizational Legitimacy for Corporate Social Performance and Disclosure *Critical Perspectives on Accounting Conference.* New York.

Li, L. (2006). *Corporate Social Responsibility Assessment Theory and Empirical Research: from the Example of Hunan Province* South Economics.

Li, S., Zhu, D., Chen, Z. (2007). *Externality Theories and the Internalization Research Review, Academic Research* China Academic Journal Website.

Locke, J. (2003). *Two Treatises of Government and A Letter Concerning Toleration.* Yale University Press.

Lovins, A.B., Lovins, L.H., Hawken, P. (2007). *A Road Map for Natural Capitalism, Harvard Business Review on Green Business Strategy.* Harvard Business School Publishing Corporation.

Low Carbon Economy Project Group. (2010). *Low Carbon Wars—China Leads the Low Carbon World*. Beijing: Chemical Industry Press.

Lubchenco, J. (1998). Entering the Century of the Environment: A New Social Contract for Science, *Science*, Vol. 279, January 23, pp. 491-497.

Lu, C. (2009). Pollution Property Transaction, Financial Living Page of Liao Ning Province Financial and Scientific Institute, Liao Ning Finance Society, No. 11, pp. 4, June 15th.

Mark, D. (2000). Sustainability and Sustainable development.*Sustainability: the Corporate Challenge of the 21st Century.* Australia: Griffin Press.

Marshall, A. Principles of Economics(reprint), New York: Prometheus Books.

Marshall, A. (1997). *Principles of Economics* (reprint), New York: Prometheus Books.

Maureen and Kane. (1998). *Ma Shengli translated, The Earth and the Motherland* Reading and New Knowledge Joint Publishing House.

Ma, X., Ortolano, L. (2000). *China Environmental Regulations: System.* Implementation and Compliance.

McCann Erikson Harris Research Center. (1990).

McGuire, J.W. (1963). *Business and Society.* New York: McGraw-Hill.

McKinsey & Company. (2008). Business Strategies for Climate Change, April, pp: 1.

McMichael, A.J. (1993). *Planetary Overload: Global Environmental Change and the Health of the Species.* Cambridge: Cambridge University Press.

McNeely, J.A. (1997). *Conservation and the Future: Trends and Options Toward the Year 2025.*

Meinshausen, M., Meinshausen, N., Hare, W., Raper, S.C.B., Frieler, K., Knutti, R., Frame, D.J., Allen, M.R. (2009). Greenhouse-gas emission targets for limiting global warming to 2 degrees C. *Nature, 458*(7242), 1158-1162.
[http://dx.doi.org/10.1038/nature08017] [PMID: 19407799]

Micheal, A.J.M. (2000). *Luo Lei et al*. translated, Dangerous Earth Jiangsu People Press.

Micheal, C.J., Li Meng, G.F. (2005). System Thinking—Creative and Integral Views for Managers, Beijing: China Renming University Press, pp. 269.

Ming, Su, Liu, Junming (2008). China's Environmental Protection Investment Insufficient Reason Analysis, *China Economic Times*, July 18th.

Monks, R., Miller, A., Cook, J. (2004). Shareholder Activism on Environmental Issues: a Study of Proposals at Large US Corporations (2000-2003). *Nat. Resour. Forum, 28*, 317-330.
[http://dx.doi.org/10.1111/j.1477-8947.2004.00104.x]

Mooney, H.A., Cushman, J.H., Medina, E., Sala, O.E., Schulze, O.E., Schulze, E.D. (1996). *Functional Roles of Biodiversity: A Global Perspective.* New York: Wiley.

Murphy, D.F., Bendell, J. (1997). *In the Company of Partners: Business, Environmental Groups and Sustainable Development Post-Rio.* UK: Polity Press.

Na, Tong (2006). Running for the International Standard of Environmental Protection, *Economic Daily*, December 19.

National Environmental. *Qual. Rep,* 1991-1995. [NEPA.].

Nash, R. (1989). *The Rights of Nature* (pp. 3-4). Madison: University of Wisconsin Press.

Nasi, J. (1995). What is Stakeholder Thinking? A Snapshot of a Social Theory of the Firm.*Understanding Stakeholder Thinking* (pp. 19-32). Helsinki: LSR-Publications.

O'Donovan, G. (1999). Managing Legitimacy through Increased Corporate Environmental Reporting: an

Exploratory Study. *Interdiscip. Environ. Rev, 1*(1), 63-99. [http://dx.doi.org/10.1504/IER.1999.053837]

O'Donovan, G. (2002). Environmental Disclosures in the Annual Report, Extending the Applicability and Predictive Power of Legitimacy Theory. *Accounting, Auditing and Accountability Journal, 15*(3), 344-371. [http://dx.doi.org/10.1108/09513570210435870]

Packard, K.O., Reinhardt, F.L. (2007). *What Every Executive Needs to Know about Global Warming, Harvard Business Review on Green Business Strategy.* Harvard Business School Publishing Corporation.

Pang, S. (2009). *General Sociological Theory.* Shanghai University Press.

Parry, M., Lowe, J., Hanson, C. (2008). *The Consequences of Delayed Action on Climate Change.*http://www3.imperial.ac.uk/pls/portallive/docs/1/53345696.PDF

Pfeffer, J., Salancik, G. (1978). *The External Control of Organizations: A Resource Dependence Perspective.* New York, NY: Harper and Row.

Pinkse, J., Kolk, A. (2009). *International Business and Global Climate Change.* UK: Routledge.

Pigou, A.C. (1920). *The Economics of Welfare.* London: Macmillan and Co..

Post, J.E., Altman, B.W. (1992). Models of Corporate Greening: How Corporate Social Policy and Organizational Learning Inform Leading-Edge Environmental Management. *Research in Corporate Social Performance and Policy, 23*, 3-29.

Preston, L.E., Post, J.E. (1975). *Private Management and Public Policy: The Principle of Public Responsibility.* Englewood Cliffs, NJ: Prentice Hall.

Preston, L.E. (1975). Corporation and Society: the Search for a Paradigm. *J. Econ. Lit, 13*, 434-453.

Qi, Z., Xu, F., Yi, S. (2004). The Current and Future of Chinese Environmental Information System. *Forum (Genova).*

Qiang, W., Kang, T. (2006). *Elion Resources Group Company: Development of New Industry into the Desert, Responsibility Competitiveness.* Beijing: Business Management Press.

Qiang, Z., Tang, D. (2002). *Culture: the Fate of the Artist's Warehouse.* Southern Weekend.

Quade, E.S., Miser, H.J. (1985). The Context, Nature and Use of System Analysis, In H. J. Miser and E. S. Quade (ed.) (1985), *Handbook of Systems Analysis: Overviews of Uses, Procedures, Applications and Practice*, North Holland, New York, pp: 1-41.

Qu, Geping (2005). The Public Participation and Social Adjustment in Environmental Protection, Chinese Environmental Newspaper, May 17, pp: 3.

Rawls, J. (1971). *A Theory of Justice.* Harvard University Press.

Rawls, J. (1993). *Political Liberalism.* Columbia University Press.

Ren, Y., Shen, D., Dong, Y. (2005). *Corporate Ecological Culture Research.* Dalian: Dongbei Financial and Economic University Press.

Rifkin, J. (1991). *Biosphere Politics: A New Consciousness for a New Century* (p. 67). New York: Crown Publishers.

Rogelj, J., Hare, B., Nabel, J., Macey, K., Schaeffer, M., Markmann, K. (2009). Halfway to Copenhagen, No Way to 2◦C. *Nature Reports Climate Change, 3*(0907), 81-83.
[http://dx.doi.org/10.1038/climate.2009.57]

Rowland, F.S. (1989). *Am. Sci, 77*(36).

Sabine, H. (1998). Von der Abfallwirtschaft zur okologischen Stoffwirtschaft: Wege zu einer Okonomie der Reproduktion, Opladen: Westdeutscher Verlag, pp: 70-301.

Schaltegger, S., Burritt, R., Petersen, H. (2003). *An Introduction to Corporate Environmental Management.* UK: Greenleaf Publishing Limited.

Schein, E.H. (1996). Three Cultures of Management: The Key to Organizational Learning. *Sloan Manage. Rev,* 9-19.

Schmidheiny, S. (1992). The Business Logic of Sustainable Development. *Columbia J. World Bus, 27*, 19-23.

Schmidheiny, S. (1992). *Changing Course: A Global Business Perspective on Development and the Environment.* Cambridge, MA: MIT Press.

Schulze, E.D., Mooney, H.A. (1994). *Biodiversity and Ecosystem Function.* New York: Springer.

Scott, A., Westervelt, R. (2008). Corporate Social Responsibility, Chemical Week, June 23, pp: 21-23.

Scott, D., Peeters, P., G¨ossling, S. (2010). Can Tourism Deliver Its "Aspirational" Greenhouse Gas Emission Reduction Targets? *J. Sustain. Tour, 18*(3), 393-408.
[http://dx.doi.org/10.1080/09669581003653542]

Sethi, S.P. (1975). Dimensions of Corporate Social Performance: An Analytic Framework. *California Management Review, 8*, 58-64.
[http://dx.doi.org/10.2307/41162149]

Shan, Z. (2007). *Report on Corporate Social Responsibility in China 2006* (pp. 15-18). Beijing: Economic Science Press.

Sharma, S., Vredenburg, H. (1998). Proactive Corporate Environmental Strategy and the Development of Competitively Valuable Organizational Capabilities. *Strateg. Manage. J, 19*, 729-753.
[http://dx.doi.org/10.1002/(SICI)1097-0266(199808)19:8<729::AID-SMJ967>3.0.CO;2-4]

Shao, J. (2007). *Small and Medium-sized Enterprises Clusters and Economic Development.* Beijing: Science Press.

Shimada, K., Tanaka, Y., Gomi, K., Matsuoka, Y. (2007). Developing a Long-term Local Society Design Methodology Towards Low-carbon Economy: An Application to Shiga Prefecture in Japan. *Energy Policy, 35*, 4688-4703.
[http://dx.doi.org/10.1016/j.enpol.2007.03.025]

Stark, A. (1994). *What's the Matter with Business Ethics?*.www.chass.utoronto.ca/~jheath/BEwithout.pdf

Steiner, G.A. (1971). *Business and Society.* New York: Random House.

Sun, Z. (2002). *Protection and Improvement of Citizen Environmental Right* Inner Mongolia Technology and Economy.

Tao, Hong (2001). Suzhou River, Chinese First Polluted River Reborn, *Shanghai Standardization*, (5): 20-22.

Tao, H., Li, L., Tian, C. (2005). *The German Environmental Administration System and Its Enlightenment, China Environment Yearbook 2005*. Beijing: China Environment Yearbook Press. http://www.pewclimate.org/companies_leading_the_way_belc

Treffers, T., Faaij, A.P.C., Sparkman, J., Seegregts, A. (2005). Exploring the Possibilities for Setting up Sustainable Energy Systems for the Long Term: Two Visions for the Dutch Energy System in 2050. *Energy Policy, 33*, 1723-1743.
[http://dx.doi.org/10.1016/j.enpol.2004.02.011]

Ulrich, W. (1983). *Critical Heuristics of Social Planning.* Bern: Haupt.

UNEP. (1995). *Global Biodiversity Assessment.* Heywood, V.H. Cambridge University Press.

UNWTO-UNEP-WMO. (2008). *Climate Change and Tourism: Responding to Global Challenges.* Madrid: UNWTO.

Villiers, M.E.D. (2001). *Yan Weiming translated, Water: the Impending Crisis of Survival* Shanghai Translation Press.

Walton, C.C. (1967). *Corporate Social Responsibilities.* Belmont, CA: Wadsworths.

Wang, G. (2006). *The Social Responsibility and Sustainable Operation of Modern Enterprises, China Corporate Social Responsibility Report* (p. 360). Beijing: China Financial and Economic Publishing House.

Wang, L., Zhang, Q. (2005). Discussion on the Administrative Division Impact on the Environment. *Conference Proceeding of Fudan University Environmental Economy Research Center the Sixth Annual Meeting and Symposium*. Fudan Environmental Economy Research Center.

Wang, Yiyuan, Yang, Dapeng (2005). Coal Supply Condition Still Serious This Year, *Economic Reference*, January 27.

Wartick, S.L., Cochran, P.L. (1985). The Evolution of the Corporate Social Performance Model. *Academy of Management Review, 10*, 758-769.
[http://dx.doi.org/10.5465/amr.1985.4279099]

WCED (World Commission on Environment and Development). (1987).

Wei, Q., Dong, S. (2006). *Japanese Circular Economy.* Shanghai: Shanghai Renmin Press.

Wilmshurst, D.W., Frost, G.R. (2000). Corporate Environmental Reporting a Test of Legitimacy Theory. *Accounting, Auditing and Accountability Journal, 13*(1), 10-26.
[http://dx.doi.org/10.1108/09513570010316126]

Wood, D.J. (1991). Corporate Social Performance Revisited. *Academy of Management Review, 16*, 691-718.
[http://dx.doi.org/10.5465/amr.1991.4279616]

Woodward, D.G., Edwards, P., Birkin, F. (1996). Organizational Legitimacy and Stakeholder Information Provision. *Br. J. Manage, 7*, 329-347.
[http://dx.doi.org/10.1111/j.1467-8551.1996.tb00123.x]

World Bank. (2001). *China: Air, Land and Water: the New Millennium Environmental Priority*.

World Resources Institute. (1994). World Resources 1994-95: A Guide to the Global Environment, Report in collaboration with the UN Environment Program and the UNDP, Oxford University Press, New York and Oxford.

World Resources Institute. (2003). *The World Well-known Business Management and Environmental Case.* Beijing: Qinghua University Press.

Worldwatch Institute. (1994). *State of the World* (p. 38). New York: W. W. Norton.

Wu, J. (2005). On the Corporate Environmental Responsibility, China Ocean Univerity Ph.D Dissertation.

Wu, W. (2007). *The Control Model to Improve the Execution of Middle Level Managers.* Enterprise Research.

Wei, X. (2005). Environmental Right as Human Right and Sustainability Development. *Philosophy Research, 11*, 8-13.

Wei, Z. (2001). *Publication of Environmental Information and Explanation of its System* Yunmeng Journal.

Xerox Corporation. (1990). *Asset Recycle Management: Asset Recycling—The Future is Here. Xerox Corporation (1991)* How Xerox Applies Quality to Asset Management.

Xian, G. (1999). *Foreign Direct Investment and the Environmental Interaction: the Case of China*.

Xu, D., Li, G. (2006). Steel and Iron Business Case in the Circular Economy Development Mode—Jinan Steel and Iron Company, China's Second Session of the Conference Proceedings on Management Cases.

Yan, M. (2003). Corporate Environmental Protection Responsibility, *Modern Law Science*, Vol. 25, No. 5.

Yan, Weidong, Ding, Xiaohong (2005). Reviewing 2004 World Mineral Resource Condition, China Gold Newspaper, January 19.

Yang, Zhaofei (2006). Many Environmental Legislations with Seven Deficiency, *Legal Daily*, July 13th.

Ying, X. (2007). Effect Analysis of Government Environmental Regulation and Public Participation on Enterprise Pollution Behavior, Doctorate Thesis of Nanjing Agricultural University, pp: 20.

Yin, G., Yu, Z., Wu, F. (2005). *Report on Corporate Social Responsibility in China.* China Corporate Social Responsibility Development Center.

Yun, F., Ma, Y., Liu, Y., Niu, W. (2008). Development Patterns of Low Carbon Economy, *China Population. Resources and Environment, 18*(3), 14-19.

Yu, Q. (2001). *Environmental Management Standardization Theory and Method—Guide for Corporate Implementation of ISO14001.* Beijing: Capital Economic and Trade University Press.

Yu, X. (2006). Corporate Social Responsibility in the Public View, Zhejiang. *Soc. Sci. (Kans.), 5*

Zeng, J. (2004). *Thinking on the Nature: Exploration on the Western Environmental Ethics Ideas.* Beijing: China Social Science Press.

Zhang, J. (2005). On Environmental Information Publication, *Henan. Soc. Sci. (Kans.),* 30-31.

Ying, F. (2005). On the Corporate Environmental Responsibility and Achievement Mechanism—from the

Perspective of Cleaner Production Law, Fuzhou University Postgraduate Degree Thesis.

Yong, Z. (2004). The Concept and Value of Corporate Social Responsibility under the Market Economic Condition, Hubei University Journal(Social Sciences edition), Vol. 5.

Yong, Q. (2004). On the Extended Producer Responsibility Policy of OECD Countries and its Effect on the Market Structure and Firm Conduct, *Industrial*. *Econ. Res. J,* (2), 9-18.

Zhuang, G. (2005). The Way and Potential Analysis of Developing Low-carbon Economy. *Studies in International Technology and Economy, 8*(3), 79-87.

Zhu, D. (2005). C Mode: China's Development in the Condition of Natural Resources Scarcity, Fudan University Environmental Economic Research Center, The Sixth Annual Meeting and Symposium, Fudan University, Dec. 18th.

Zhu, D., Yuan, Z. (2006). Circular Economy: an In-depth Study from Three Aspects. *Soc. Sci. (Kans.),* (4), 46.

Appendix

Part One. A. Sex:_____ Age:_____ Corporation:_____

B. Number of employees: _____

C. Type of Corporation
1. Foreign-capital enterprise
2. Sino-foreign joint venture
3. State-owned enterprises
4. Private enterprise

D. Position
1. Part-time
2. Junior staff
3. Mid-level stall
4. Senior manager
5. Others

Part Two. The following table does some depicts about the environmental responsibility and conduction of corporation, please make your choices in actual situation. The following questions are not right or wrong, just choose your answer according to your understanding or tick. If you have any questions, ask the investigator. Only one option can be selected for each question (1, 2, 3, 4, 5 in order to increase the degree).

A1	Governing impact on the design of corporation's environmental regulations	1 (There is no regulation)	2	3	4	5 (The intensity is very large)
A2	Governmental to the corporation's environmental management	1 (No specific measures)	2	3	4	5 (Complete measures)
A3	Your company implements the quality of government environmental regulation	1 (Below the standards)	2	3	4	5(Beyond the standards)
A4	Environmental policies which the corporation take part in designing	1(No influence)	2	3	4	5 (Great business influence)
B1	Investors' demand to the corporation's environmental management	1 (No requirement)	2	3	4	5 (Very demanding)
B2	Frequency of corporation's environment report sending to the investors	1 (Never reported)	2	3	4	5 (Frequently report)
B3	Consumers' demand to the corporation's environmental issues	1 (No requirement)	2	3	4	5 (Very demanding)
B4	Corporation's reaction to the consumers' environmental demand	1 (Not considered)	2	3	4	5 (Great attention)

Contd.....

B5	Business partners' demand to the corporation's environmental management	1 (No requirement)	2	3	4	5 (Very demanding)
B6	Corporation's demand to the environmental conscious and competence of suppliers.	1 (No request)	2	3	4	5 (Very high requirement)
B7	Peer corporation's impact to the corporation's environmental management	1 (No impact)	2	3	4	5 (The high impact)
B8	Quality of corporation's environmental management in the industry	1 (At the bottom)	2	3	4	5 (At the leading position)
B9	Corporation's criteria to the environmental management	1 (No)	2	3	4	5(Has passed ISO14000)
C1	Corporation's strategies to the environment	1 (No)	2	3	4	5 (Very complete)
C2	Corporation's attitude in undertaking environmental responsibility	1 (No consideration)	2	3	4	5 (Including in)
C3	Corporation's demand to the relative environmental laws and statutes	1 (No consideration)	2	3	4	5(To Ensure implementation)
C4	Corporation's prevention program to the district air pollution	1 (No)	2	3	4	5 (Very clear definite)
C5	Resources, responsibility and authority in corporation's environmental management	1 (No)	2	3	4	5 (Very clear definite)
C6	Corporation's attitude to the omission of environmental administrators	1 (No fault system)	2	3	4	5 (Serious punishment)
C7	Corporation's information interaction during environmental management	1 (None)	2	3	4	5 (Adequate)
C8	Corporation's files about environmental management	1 (None)	2	3	4	5 (Complete record and control)
C9	Corporation's operating control in the environmental management	1 (None)	2	3	4	5 (The rules are very clear)
C10	The potential emergent incidents provoked by corporation might affect environment	1(No contingency plan)	2	3	4	5(The response procedures are complete)
C11	Corporation's operating supervise and gauge to the environment	1 (No)	2	3	4	5 (The equipment is well maintained and has records)
C12	Corporation's performances in environmental revise and prevention aspects	1 (No)	2	3	4	5 (very effective)
C13	Your business is in environmental record control	1 (No)	2	3	4	5(Logo clear, can query)

Contd.....

C14	Your business is in the internal audit of the environment	1 (No)	2	3	4	5 (Audit objective and fair)
C15	Your business is in environmental assessment	1 (No)	2	3	4	5 (Comprehensive and improved recommendations)
C16	The timeliness of the environmental information issued by your enterprise	1 (Very lagging behind)	2	3	4	5 (Very timely)
C17	The accuracy of the environmental information released by your business	1 (Very vague)	2	3	4	5 (Very precise)
C18	Your company uses air pollution control technology to reform the production process	1 (Not used)	2	3	4	5 (Prior to the use of pollution-free or less polluting process)
C19	Your organization matches the right raw materials to reduce pollution	1 (No matching)	2	3	4	5 (Priority matching)
C20	Your enterprises' installation of waste gas purification device, the pollution source for governance and the discharge of air quality standards	1 (Not installed)	2	3	4	5 (Having complete management measures)
C21	The total amount of greenhouse gas emissions in your business	1 (Very high)	2	3	4	5 (No emissions)
C22	Your business to support green low-carbon product development and sales	1 (No action)	2	3	4	5(Having concrete measures)
D1	How do you like your company's reputation is improving?	1(Low reputation)	2	3	4	5 (Very high reputation)
D2	How do you like your business investor satisfaction is improving?	1(Low satisfaction)	2	3	4	5 (Very satisfied)
D3	How do you like that consumer satisfaction is generally improved?	1(Low satisfaction)	2	3	4	5 (Very satisfied)
D4	What do you think of your business being resource-saving and environmentally friendly?	1(Low satisfaction)	2	3	4	5 (Very satisfied)
D5	What do you think of environmental responsibility in social responsibility?	1 (Bottom)	2	3	4	5 (The first place)

Three A. Does your company have a corporate social responsibility department? What is the understanding of social responsibility (including what factors):

B. What are the difficulties and deep-seated reasons for your environmental responsibility?

C. What is your published method to company's environmental information?

1. Municipal Environmental Protection Bureau
2. District Environmental Protection Agency
3. Through the media
4. Through your company's websites
5. There is no suitable way

(Note: Please select the details of 3 and the reasons for their choice)

Specific content:

Reasons for selection:

D. What are your company's expectations for the current smog situation?

Thank you for your support. Wish you good health and all goes well.

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Wang Hong

Wang Hong, an associate Professor, obtained her PhD degree in management science in 2008. Now she is a master tutor at the School of Economics, Shanghai University. She had been an academic scholar at Leicester Business School of De Montfort University in UK for 1 year. A Distinguished Corporate Social Responsibility (CSR) professor David Crowther guided her in the research on CSR, which is her continuous concentration. Currently, she teaches the courses of Theory and Practice CSR, Business English, and Strategic CSR. Successively, she participated in the international conference in the UK, Germany and Finland and delivered speeches based on CSR paper. She has published more than 40 CSR papers in academic journals at home and abroad, as well as one Chinese monogragh. She and professor David Crowther cooperated a textbook *Corporate Social Responsibility and Chinese Governance*. Later in 2018, it will be published by Beijing Economy and Management Publishing House in China.