Requirements and guidelines for enterprise carbon emission management information disclosure

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Abstract. As the significant bridge of communication between the enterprise and stakeholder, the enterprise carbon emission management information disclosure has gained more and more attentions. This paper introduces the purposes and basic principles of the enterprise carbon emission management information disclosure, investigates the domestic and overseas carbon emission management information disclosure conditions, illustrates the main contents contained in the enterprise carbon emission management information disclosure, and demonstrates the measurement methods of enterprise carbon emission management information disclosure. Finally, this paper discusses the advantages and disadvantages of establishing the enterprise carbon emission management information disclosure market in China, the significance of implementing the enterprise carbon emission management information disclosure, and prospects the future of enterprise carbon emission management information disclosure.

1. Introduction
In recent years, the climate and environmental problems have already become a growing concern worldwide. All the major developed countries in the world are making the transition to low-carbon economy. Through various efforts of the international community, the United Nations Framework Convention on Climate Change (hereinafter referred to as "UNFCCC") was signed in 1992, which defined the joint responsibility that should be undertaken by all countries worldwide. Besides, the Kyoto Protocol signed in December, 1997 was the milestone that global human efforts were made to protect the environment of the earth and achieve the sustainable development, and the symbol that the government of every country considered to accept the legally binding restrictions or obligations of greenhouse gas emission reduction for the first time. On February 16th, 2005, Kyoto Protocol came into force. This was the first time in human history when the greenhouse gas emission was restricted in the form of regulations. Thus, a series of creative cooperative mechanism was established to reduce the greenhouse gas mitigation costs. The Kyoto Protocol provided the legal carbon emission allowances and the specific operation method of carbon emission reduction achieved through international cooperation. Afterwards, the international carbon emission trading market and carbon emission trading mechanism were gradually established, while the explosive growth of global carbon emission trading market occurred. In 2007, the global carbon emission trading market value reached EUR 40 billion, which rose by 81.8%, compared with the EUR 22 billion in 2006. The global carbon emission trading market value on the first half year of 2008 was the same as the whole year of 2007. Besides, the global carbon emission trading market capacity reached USD 150 billion. China has the
enormous carbon resources. At present, the carbon emission reductions provided by China has accounted for about a third of the global market, topping on the second position worldwide [1-5].

As mentioned in the 19th CPC National Congress Report, China shall further vigorously promote the green and low-carbon development, and establish and perfect the economic system of green, low-carbon and circular development. In order to comply with the global trend, China formulates the target of achieving a 40-45% reduction in carbon emissions per unit of GDP by 2020 (compared with 2005), giving consideration to "low carbon" and "new normal" of economic development. Meanwhile, China also actively constructs the regulations of carbon emission information disclosure system and establishes the corresponding platform. During the low carbon economic development process, the government may closely monitor the enterprise carbon emission conditions by constructing the carbon emission information disclosure system, continuously and dynamically analyze the enterprise emission conditions as per the latest data provided by the enterprise, and use this as the significant evidence for the government to formulate the carbon emission reduction target in the following years. Meanwhile, the enterprise may fully understand its own carbon emission conditions as per the carbon emission information disclosure system, and adjust the emission reduction structure. And the enterprise may also seek the business opportunities of its sustainable development during the reform process, and undertake the social responsibilities in a better manner.

2. Purposes and basic principles of enterprise carbon emission management information disclosure

The enterprise carbon emission management information disclosure intends to provide the monetary or other quantitative information and forming information that is useful for the decision-making of stakeholders and related to the enterprise carbon activities. Combined with the present actual situations of economic development stage in China, it is found that the enterprise operation will be much easier to be affected by the climate change and carbon emission permits, while the public awareness of rights and environmental demands are growing, and the government also advocates the low-carbon development strategy. For the enterprise manager, the carbon information demand contains the following contents: the carbon risk confronted by the enterprise and strategic arrangement of coping with risk, enterprise carbon emissions and carbon trading status, carbon emission mitigation costs and mitigation performance, carbon trading gains and losses, auditing and authentication of carbon information, while it intends to reduce the carbon permit risk, formulate the low carbon strategy, and implement the decision-making of low carbon management.

The basic principles of enterprise carbon emission management information disclosure include: the reliability, completeness, effectiveness, comparability and timeliness.

The reliability of enterprise carbon emission management information disclosure is to require the enterprise to carry out the confirmation, measurement and report as per the actually incurred carbon trading or issues, truthfully reflect all sorts of information disclosure element and other relevant information conforming to the confirmation and measurement requirements, and ensure the truth, reliability and completeness of the enterprise carbon emission management information disclosure contents. When the information has no significant error or deviation, and can truthfully reflect the information that is proposed to be reflected or shall be reflected and shall be used as the evidence by the user, such information is reliable.

The completeness of enterprise carbon emission management information disclosure refers to whether all the information related to the issue that shall be done by the user of enterprise emission management information is included. In order to ensure the completeness of enterprise carbon emission management information disclosure, it is required to avoid the data loss or redundancy, and ensure the consistency of transmission order.

The effectiveness of enterprise carbon emission management information disclosure refers to the restrictions of disclosure information in contents and quantity. The input of qualified information is allowed. Otherwise, the input is prohibited. Thus, the wrong data entry will be avoided through checking the information correctness and effectiveness of disclosure information by the system.
The comparability of enterprise carbon emission management information disclosure is that the carbon emission management information provided by the enterprise shall be comparable. The same or similar carbon trading or issue occurring to the identical enterprise in variable periods shall adopt the consistent policy, which shall not be changed at will, and so as to facilitate the vertical comparison of all sorts of indicators in variable periods.

The timeliness of enterprise carbon emission management information disclosure is to require the enterprise to timely carry out the confirmation, measurement and report upon the actually incurred carbon trading or issue, without any advancement or postponement.

3. Domestic and overseas enterprise carbon emission management information disclosure conditions

The carbon emission management information disclosure adopts the target of energy conservation and emission reduction, helps the stakeholder identify the carbon risk and screen the good projects, and enhances the efficiency of investment and finance and efficiency of resources allocation, so as to improve the enterprise management level and enhance the enterprise low carbon competitiveness. The carbon emission and climate change will bring the risks and opportunities to the enterprise operation, financial transaction (including carbon trading), supply chain and plan and other business activities. Therefore, it is very important to disclose the enterprise carbon emission information and climate change influence and other information. The United Nations Environment Programme "Finance Initiative" advocates promoting the disclosure of carbon information and climate change risks of the entire economy in the financial market, so as to further promote the market transparency.

3.1 Overseas enterprise carbon emission management information disclosure conditions

3.1.1 Overseas requirements upon the carbon emission information disclosure by listed companies.

On January 27th, 2010, the U.S. Securities and Exchange Commission (hereinafter referred to as "SEC") issued an interpretive release, Commission Guidance Regarding Disclosure Related to Climate Change, guiding the listed companies how to make the disclosure related to climate change. This was the first climate risk disclosure regulation within the economic system worldwide, requiring the listed companies to disclose to the investors the significant impacts of climate change upon the enterprise operation. It mainly makes the disclosure related to climate change from the following four aspects: company business, involved legal proceedings, major risk factors and management-level discussion and analysis. When evaluating the potential disclosure obligations, the enterprise shall consider the possible impacts of laws, regulations, and international agreements, or indirect consequences caused by the business development trend, and the direct impacts caused by the climate change.

The issuance of such guidance by the SEC is related to the greenhouse gas emission supervision strengthened by other institutions. On March 13th, 2009, Risk and Insurance Management Society passed a compulsory regulation, requiring the insurance companies with the annual premiums of USD 500 million or above to disclosure their financial risks encountered due to the climate change since May, 2010. On October 30th, 2009, the U.S. Environmental Protection Agency issued the Mandatory Reporting of Greenhouse Gases, requiring the enterprises with enormous greenhouse gas emissions to collect and report their greenhouse gas emission conditions.

In 2008, the UK issued the Climate Change Act, formally including the greenhouse gas into the national strategy development framework. The UK government required all the listed companies to fully disclose all the greenhouse gas emission details. In 2013, the UK government issued the Draft Greenhouse Gas Emissions (Directors' Reports) Regulations, further standardizing the quantitative carbon emission information in the directors' reports disclosed by the enterprise.

The Canadian government began to require the enterprises with the annual carbon emissions of more than 100,000t to make the compulsory disclosure of carbon emission related information under the guidance of Greenhouse Gas Emissions Report, since 2004. In 2009, the Canadian government
further down-regulated such standard as 50,000 tons, and attempted to establish a safe and economic greenhouse gas reporting system, attempting to provide to the government the disclosure guideline, carbon measurement methods and etc. The Certified General Accountants Association of Canada (hereinafter referred to as "CGA-Canada") actively responded to the government, carrying out the carbon supervision activities. In 2005, CGA-Canada issued the Report of Disclosing the Climate Change and other Environmental Impacts (Interpretative Draft), which discussed how to identify and cope with the financial risks related to climate change from the perspective of accounting standard for the first time.

In general, USA, UK, Canada and other countries issued the laws and regulations to guide the enterprise carbon emission management information disclosure, and also constructed the government supervision system. However, the enterprise might rely on variable standards for carbon emission information disclosure. Internationally, some sorts of information disclosure framework with higher recognition level provided some constructive suggestions upon the enterprise carbon information disclosure from variable perspectives and by different means. However, the adopted standards are not unified internationally, which causes that the carbon information finally disclosed by the enterprises in every country does not have the horizontal comparability. And it is hard for the governments, investors and other stakeholders to obtain the truthful and effective decision-making information.

3.1.2 Contents involved in carbon information disclosure
At present, the "Carbon Disclosure Project" (hereinafter referred to as "CDP") is the classical example for some international enterprises to voluntarily carry out the carbon information disclosure. The CDP formulated a relatively complete enterprise carbon information disclosure framework, mainly including the following four aspects. First, the risks and opportunities resulted from the climate change; the risks include the legal risks, natural risks, competitive risks and reputation risks, while the opportunities include the legal opportunities, visible opportunities and other opportunities. Second, carbon emission accounting, including the selection of carbon accounting methods, preparation of carbon emission reduction accounting report, external verification and auditing, direct emission reductions and indirect emission reductions, comparison of annual carbon emission difference, and etc. Third, carbon emission reduction management, including the emission reduction project, emission permit trading, emission intensity, energy cost, emission reduction planning and etc. Fourth, climate change governance, including the emission reduction responsibility and independent contributions, and etc.

3.1.3 Overseas enterprise carbon emission information auditing
In some developed countries, some industrial management agencies also formulated the carbon emission auditing standards, except for requiring the enterprise to disclose the carbon emission information. In 2003, the American Institute of Certified Public Accountants (hereinafter referred to as "AICPA") prepared the Authentication Service of Greenhouse Gas Emission Information. In the same year, the Canadian Institute Of Chartered Accountants (hereinafter referred to as "CICA") formulated the Practice Guidance: Auditing Service of Greenhouse Gas Emission Information. In 2008, the Australian Department of Climate Change issued the Guidelines for National Greenhouse Gas Emissions and Energy Consumption, which provided the guidance for the auditing of carbon emission information.

3.2 Practice development of domestic enterprise emission management information disclosure
3.2.1 Domestic requirements upon the carbon emission and other information disclosure by the listed companies
The carbon emission information disclosure made by listed companies in China is still in the early stage, while most of the relevant rules mainly encourage the voluntary disclosure.
The Shanghai Stock Exchange (hereinafter referred to as "SSE") issued the Guidelines on Listed Companies' Environmental Information Disclosure, which encouraged the listed companies to disclose the type, amount, concentration and destination of annually emitted pollutants, and also required the listed companies to provide on the list of enterprises with serious pollution by the environmental protection department, to disclose the name, emission manner, emission concentration, total amount, out of limits and out of the total amount conditions of its own pollutants.

In March, 2014, the SSE Financial Innovation Lab issued the Carbon Efficiency Analysis and Product Development Research of Listed Companies in Shanghai report, which suggested the regulator to issue the carbon emission information disclosure rules of listed companies at the earliest, gradually changing from the voluntary and encouraged disclosure to the compulsory disclosure.

3.2.2 "Chinese Enterprise Carbon Disclosure" project
In 2013, the Beijing Emissions Trading Association commenced the "Chinese Enterprise Carbon Disclosure" project, together with the carbon trading platforms in Beijing, Tianjin, Shanghai, Shenzhen and other pilot regions. It intended to help the Chinese enterprises figure out a set of carbon disclosure system that conforms to the requirements of governmental emission reduction policy and is applicable for the enterprises' actual operation, and promote the consistency of Chinese enterprises' carbon disclosure standards. Meanwhile, it also intended to help the enterprises enhance the awareness and capacity of carbon risk management, and actively implement the emission reduction policy, so as to minimize the emission reduction cost.

China has already had a certain foundation in exploring a set of carbon disclosure system that conforms to China's actual conditions. For instance, the SSE's Carbon Efficiency Analysis and Product Development Research of Listed Companies in Shanghai report, carried out an overall study upon the present status of China's carbon efficiency, and also proposed the estimation model and indicators of carbon efficiency based on the disclosure information from the listed companies, which provided a certain operation foundation for the unified carbon accounting standards. Besides, China's existing carbon emissions monitoring system might provide the technical support for carbon emissions monitoring and carbon trading.

3.2.3 Information disclosure of enterprise's fulfillment of carbon emission reduction obligations
Shanghai has already docked the enterprise carbon emission reduction credit management with the public credit information service. In April, 2014, Shanghai Municipal Carbon Emission Trading Pilot Works Leadership Group reached the docking agreement with the Shanghai Municipal Administrative Office of Credit Information Collecting and Shanghai Municipal Public Credit Information Service Center. For any unit, carbon emission auditing third-party organization and trading participant incorporated into the carbon emission quota management in Shanghai, any of their illegal behaviors and other bad credit records occurring during the process of carrying out the carbon emission monitoring, reporting, auditing, settlement and trading, will be uploaded into the public credit information service platform [6].

4. Main contents contained in enterprise carbon emission management information disclosure
The enterprise carbon emission management information disclosure shall not only satisfy the information requirements of variable stakeholders at the present stage, but also give consideration to the future development trend of carbon information disclosure. With reference to the carbon emission management information disclosure contents defined by the international organizations and in combination with the policy tone of China's low carbon economy, this paper proposes that Chinese enterprises' carbon emission management information disclosure shall include the following main contents [7]:

a) The risks, opportunities, response strategies and policies and guidelines related to the enterprise carbon emission;

b) Enterprise carbon emissions;
c) Carbon emission reduction measures implemented by the enterprise and performance;
d) Enterprise carbon trading;
c) Carbon emission management information auditing and assurance;
f) Other relevant carbon emission management information.

It is required to focus on the enterprise carbon emission strategy, carbon emission conditions, carbon emission reduction measures and performance and other information in the disclosure contents, which may promote the enterprise to gradually reduce the carbon emissions, enhance the low carbon competitiveness, and facilitate the enhancement of enterprise management performance and sense of social responsibility.

5. Measurement methods of enterprise carbon emission management information disclosure

The measurement methods of enterprise carbon emission management information disclosure include: reputation scoring method, index method, content analysis method, and etc.

The reputation scoring method adopts the questionnaires distribution method to understand the evaluation of the respondent upon variable enterprises, while the respondent shall score each properly set index, and the total score of each index will be the reputation score of such enterprise.

The index method is that the investigator will evaluate the enterprise carbon emission management information disclosure level through the index construction. The index construction procedure is as follows: Firstly, the information disclosure will be classified into the main class; Secondly, it is required to determine the sub-classes covered by the main class; Thirdly, it is required to classify each subclass into the quantitative and qualitative description, and make the assignment upon both of them; Finally, it is required to total up the scores of quantitative and qualitative description of each subclass, while such total score is the score of carbon emission management information disclosure.

The content analysis method is to determine the score value or numeric value of every specific item through the analysis upon all sorts of reports or documents published by the enterprise, so as to make the overall evaluation upon the information disclosure.

6. Advantages and disadvantages for establishing the enterprise emission management information disclosure market in China

6.1 Advantages

The carbon emission trading has already had a certain social foundation in China, which has a significant impact upon the economic development. As per the international clean development mechanism, the local emission reduction cost of enterprises in developed countries is very high, while the actual emission reduction cost of enterprises in China is much lower. Therefore, the carbon emission reduction credit of enterprises in China may gain the higher profit by selling out on international market, which is in favor of the development of renewable energy and the optimization of China's energy utilization structure. The transformation of China's economic growth manner from the extensive pattern to intensive pattern, is significant to promote the development of low-carbon economy and perfection of carbon emission management information disclosure system [8].

6.2 Disadvantages

The carbon emission information disclosure attains less attention from many enterprises in China, which requires more encouragement or pressure. The existing carbon information disclosure system is imperfect. Although some companies give the cause of business secret, fundamentally speaking, most companies are lack of the corresponding data collection system. Even some well developed companies also cannot provide the description of emission history, data external verification/ inspection and data accuracy.

In general, as the per capita emissions of carbon dioxide in China is lower than the average level of developed countries and the world, China will not undertake the emission reduction obligations during the first round of contract fulfillment period of Kyoto Protocol. However, China still faces much
greater emission reduction pressure. Although China has made tremendous achievements in energy consumption reduction and greenhouse gas emission reduction in recent years, China still faces a lot of issues in energy utilization manner, energy consumption, greenhouse gas emission, and etc.

7. Significance of implementing the enterprise carbon emission management information disclosure

First, the implementation of green and low carbon development policy is facilitated and the action efficiency is reflected. The enterprises are required to disclose the carbon emission information and incorporate it into the credit rating, which will quantify the enterprise emission reduction efforts and promote the enterprise to enhance its initiative and effectiveness in participation in the green and low carbon development.

Second, the reduction of market risks and enhancement of enterprise value is facilitated. It is required to incorporate the carbon emission conditions into the credit rating and information disclosure, which will provide the more overall and objective information to the investors. For enterprise, its climate change risks may be rationally analyzed and properly evaluated, and the enterprise with the higher credit rating and public and transparent emission information will have the higher reputation and better development prospect.

Third, it will facilitate the promotion of carbon trading financialization and ensure the stability and order of carbon market. For one thing, the carbon credit rating and information disclosure is the significant support of carbon trading financialization. The carbon trading financialization may activate the carbon market and enhance the capacity of promoting emission reduction through carbon trading. For another thing, the carbon emission and carbon trading derivatives also require the corresponding auditing and risk management. The credit rating and information disclosure are like two firewalls of carbon market, which will have the pre-alarming and credit risks demonstration function by the third-party independent evaluation and open and transparent information release.

Fourth, it will facilitate the promotion of carbon market integration.

8. Outlook

With the social development and progress of human civilization, it is not hard for us to find that Chinese enterprises have already gained a certain progress in coping with the climate change. However, it is also undeniable that there is still a long way to go for Chinese enterprises. We wish that more Chinese enterprises will establish the carbon accounting system and enhance the information accuracy and transparency. It will not only facilitate the enhancement of the enterprise's own carbon management capacity, but provide more confidence to the enterprise's stakeholders in coping with the climate change and practising the low carbon development. China shoulders heavy responsibilities in coping with climate change, which requires the engagement of many parties. We wish that the enterprise carbon emission management information disclosure may find its own coordinates and make more contributions to the development of China's low carbon economy and global response to climate change.

9. Conclusion

The disclosure of carbon emission information by enterprises is one of the important measures to solve the global climate problem. At the same time, the construction of enterprise carbon emission information disclosure system is conducive to meeting the requirements of the government, enterprises, the public and other stakeholders, for information on greenhouse gas emissions and energy consumption. With the establishment and promotion of China's carbon emission trading market, the disclosure and reduction of greenhouse gases by enterprises will become a trend, which will certainly receive more attention. However, the research on carbon emission information disclosure is not comprehensive and systematic. How to enrich the core connotation of the theory and effectively carry out carbon management is still a subject requiring further research in the future.
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