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Environmental Auditing: An Informationized Regulatory Tool of Carbon Emission Reduction

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Abstract

Explore the diversity of carbon reduction instruments is significance for fulfill of scientific outlook on development, and practice of Kyoto Protocol and Copenhagen Treaty, as well as the realization of economic and environmental sustainability. Representative of the environmental audit of information technology tools for the implementation of cost and time efficiency advantages, is considered for the next generation of management tools, information-based instrument and the traditional command-and-control instrument, market-based instrument constitute the current environmental regulation of the three main approach, the paper analyzes the research status and perspectives of carbon reduction regulation instruments, particularly demonstrates the motivation, contents, methods and application of environmental auditing, on this basis, put forward several recommendations for China's environmental auditing future development in order to its better play in energy conservation and emission reduction.

Keywords:Sustainable development; enviromental auditing; carbon reduction; information-based instruments

1. Introduction

The selection and implementation of carbon emission reduction tools is an important part of the environment economics and sustainable development research. Relevant documents show that, in order to deal with the acid rain and atmosphere changing caused by regional and global air pollutants, traditional environment regulatory tools are divided into two types—imperative & control tools (including administrative licensing, product standards, technical regulations and technical standards, emission performance standards, regulations of manufacturing techniques, etc.), and marketized tools (including

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gas emission taxes, emission right trade, emission reduction subsidies, giving awards for encouragement, manufacturer's responsibilities, etc.) [1]. Policy makers often tend to select the imperative & control tools, but due to that direct control itself has a strong political tint, high cost and easily causes "rent providing" and "rent seeking", which often brings bad results [2-4]. Compared with imperative & control tools, marketized tools such as carbon taxes and carbon emission right trade are more used by environmental economists. Carbon tax was first levied by Finnish government in 1990. Some north European countries including Finland, Norway, Denmark, Sweden and Holland have levied carbon tax for more than 10 years. However, it works differently. Some researchers think that carbon tax is indeed a low costing but efficient tool for the reduction of green house gas emission [5-7]; but it also has been discovered that carbon tax has little influence on the reduction of green house gas emission. Take Norway for instance, it has been levying high carbon tax since 1991, however, it is estimated that the carbon tax only accounts for 2% influence on reducing CO2 emission, which is mainly due to the inexact provisions of carbon tax concession [8]. It has been widely believed that carbon emission right trade is one of the economic tools having the best market efficiency to reduce carbon emission. Emission Reduction Credit, the Offset Policy, the Bubble Policy, the Banking, and the Netting Policy have been applied to control regional air pollutants since 1970s; the three flexible mechanisms put forward in the Kyoto Protocol—Joint Implementation (JI), Clean Development Mechanism (CDM) and Emission Trade Mechanism (ET), are related to the carbon emission right trade among different countries. It's generally believed that for the three flexible mechanisms mentioned above, the cost of emission reduction with a trade system is lower than that without one; and the emission reduction cost of carbon Emission Trade (ET) mechanism is lower than those of other emission reduction mechanisms [9]. Carbon Emission Trade (ET) mechanism involves emission loads of all departments, but Joint Implementation (JI) mechanism and Clean Development Mechanism (CDM) only involve a few departments, such as agricultural department, energy department and energy-intensive department. Therefore, the distribution of low costing emission reduction opportunities for Joint Implementation (JI) mechanism and Clean Development Mechanism (CDM) is not better than that for carbon Emission Trade (ET) mechanism [10]. At present, transaction varieties in international carbon exchange market mainly include: AAUs (Assigned Amount Units), ERUs (Emission Reduction Units), ICERs (Incremetnal Cost-Effectiveness Ratios), RMUs (Removal Units), EUAs (European Union Allowances), ERs (Emission Reductions) etc. Compared with carbon tax, carbon emission right trade can ensure to achieve the goal of emission reduction, but the emission reduction costs are uncertain [11]. Although marketized tools such as carbon tax and emission right trade have lower costs and better abilities to achieve the goal, they are rarely used in developing countries, which is mainly because that marketized tools need a good system foundation, however, itwon't turn out ideal effects by imperatively implementing marketized tools in developing countries and during initial period of environmental regulations that are lack of necessary systemfoundation [12-13].

The complexity of environment is the objective background of constant innovations of regulatory means of emission reduction and constant emergence of new tools. In recent years, developed countries particularly valued the coordination between economic goals and environmental goals, and the coordination between policy guiding and active participating in environmental regulation that a number of new communicative, exhortative and volunteer ways, new means and new methods are unveiled. Information supplying is called the "third wave" (third to imperative & control tools and marketized tools) of environmental regulatory tools. Its popularity can be explained by the change of costs of supplying, handling and spreading relevant information [14]. Information disclosure could make the emission in the air—especially the air pollution, to which the public is very sensitive, reduce much more than expected [15]. Because independent authentication is helpful for improving the reliability of information publication, informationized tools (including environmental auditing, environment authentication, ECO-Label, environment agreement and environment administration systems, etc.) mostly represented by

environmental auditing are getting more and more attention from the public [16]. Informationized tools have been considered as governing tools orienting the next generation for their excellent advantages in execution costs and time efficiency (as shown in Table 1) [17].

Table 1. Comparison among Environmental Regulatory Tools

Method	Results of Environmental Improvement	Execution Efficiency (Monitoring and Execution Costs)	How technical innovation in enterprises or administrative innovation in governments is driven?
Imperative & Control Tools	Remarkable	Higher Cost	Little
Marketized Tools	Uncertain Gross (Except Emission Right)	Higher Cost	Higher
Informationized Tools	Uncertain Gross	Lower Cost	High

Although new tools of international environmental regulation come forth constantly, it doesn't mean the new patterns completely replaces the old ones [18], In the control of regional and global air pollutants, there is no fixed government intervention mode, nor independent regulatory tools. Imperative & control tools, marketized tools as well as informationized tools all have their chances to play [19]. Which one of the environment regulatory tools is more effective under a certain circumstance depends on the environmental problem itself, as well as social, political and economical conditions.

2. Current Research Status and Development Trends of Environmental Auditing

2.1. Causes of Environmental Auditing

Compared with traditional imperative & control tool, the occurrence of environmental auditing is supposed to seek more effective environmental regulation performance and promote agents proceeding self-environmental regulation [20]. The research report issued by the U.S. Government Accountability Office also suggests that environmental auditing could reduce the cost while improving environmental performance [21]. There are the principal-agent theory and stakeholder theory that support environmental auditing as an environmental regulation tool theory. The principal-agent theory believes that government lives on tax-paying social publics and tax is "a kind of transaction between the government and tax payers", both of whomcreat a contractual relationship. While the publics pay out taxes, the government offers environmental conservation, national security and other public services to meet the social public's needs. There is an agent relation between the government and the social public. Among them, the public is the principle, and the government is the agent. Environmental auditing is an institution arrangement that assures the entrusted environment responsibility to be fulfilled effectively. Independently checking up and evaluating the performing status of the entrusted environment responsibility by the auditors, we can reduce asymmetry of information and impel the agent to perform his responsibilities dutifully [22].

The stakeholder theory thinks that there is a strong relationship between executing social responsibilities such as environmental protection and the corporate image. Companies having good environmental performance is more likely to be accepted by consumers, investors, shareholders, suppliers, community organizations and among others [23]. After auditing, the credibility of environmental information will be more powerful to influence information users or stakeholders to be willing (or not willing) to set up, maintain or improve the attitude of the relationship with the information providers and

by extension to influence the financial performance of the cooperation [24]. For instance, after surveying 125 European major companies, Rory found that with the climate change rules each country decreed, most of the 125 corporations have set up environmental management system and have taken effective measures to deal with commercial risks. It is particularly reflected in 20 high impact departments (electricity, fossil oil, and natural gas, mining), 17 of which regularly reveal audited carbon emission messages regularly according to Greenhouse Gas Protocol (WBCSD/WRI), among which 15 reveal the carbon emission data in the report for 5 continuous years. Compared with those other 3 companies which didn't reveal carbon emission data regularly, some financial index in the 17 corporations mentioned above, such as inventory turnover rate, is on more ideal standards [25].

2.2. Contents of Environmental Auditing

Since auditing stepped into the field of pollution abatement and energy conservation as a regulatory instrument, the content of environmental auditing develops unceasingly to adapt the changes of environment protection and the needs of different information users. Take GAOas an example, in the early 20th century, the environmental working plan of GAO totally focused on financial audit. However, from the 1970s and the 1980s, GAO began to poured abundance resources into performance audit. On account of the Congress passed many environmental laws in the period, environmental expenses went up as the same. In the 1990s, the Congress often required GAO to answer the questions concerned to policy evaluation, including, how to revise some environmental laws to better achieve its anticipated results; or how to better allocate resources to win higher returns. Therefore, the auditing related to the potential impacts of environmental policies auditing has become another focus for GAO.

With respect to the specific content, INTOSIA considers that environmental auditing shall mainly pay attention to environment, natural resources and sustainable development. Contents of environmental auditing include: 1) financial audit; 2) compliance audit; 3) performance audit. IFAC indicates that environmental auditing contains the following types: 1) evaluation on place contamination; 2) evaluation on environmental impacts of planned investment projects; 3) due concern audit of the environment; 4) audit of environmental performance report of companies; 5) audit of the conditions of organizing environmental laws and regulations. IIA divides the contents of the environmental auditing into 7 parts, which are 1) compliance audit; 2) environmental management system audit; 3) trading audit; 4) process, store, and manage institution audit; 5) pollution prevention audit; 6) accrued environmental liabilities audit; 7) product audit. Besides, World Bank, ICC, ISO, FEE, CICA, and EPA have all defined the contents of environmental auditing from different points of view.

2.3. Methods of Environmental Auditing

In the course of environmental auditing, we must adequately consider the three elements of sustainable development, namely, economic growth, environmental conservation and social progress. This means a further expanding of traditional financial audit method [26]. Lightbody holds that the earliest environmental auditing are "audit" and "censor" activities not carried out by the accountants. With the continuously enhanced expected value of environmental auditing and various specialized persons intervening, auditors shall construct their own "Know-how" to overcome the distance between theory and method [27]. Power points out that auditors shall explore an effective combination of traditional financial audit and environmental auditing. Meanwhile, auditors are necessary to take some scientific techniques during the process of environmental auditing [28]. INTOSIA indicates that INTOSIA needs to seriously formulate a methodology in environmental auditing. Hereby we could make a reliable conclusion on

whether a certain function or activity could execute effectively. For this purpose, the methods we can take are on-site inspection, standard questionnaire, statistical sampling, etc. [29].

3. Practices of Environmental Auditing in Carbon Emission Reduction Regulation—Case of Canada and US

3.1. Practice of Carbon Emission Environmental Auditing in Canada

In 2007, the Kyoto Protocol Enforcement Act was passed by the Canada Congress, so as to ensure that Canada could take timely and effective actions to fulfill their obligations in accordance with Kyoto Protocol and promote the globe climate change handling. The bill required that the Environment Minster shall formulate and implement annual climate change solution to deal with Canada Greenhouse gases source. The solution included a series of measures to reduce emission of Greenhouse gases and report progress of implementing last annual bill.

The Office of Auditor General of Canada audited the progress of implementing Kyoto Protocol Enforcement Act and fulfilling their obligations in accordance with Kyoto Protocol in Canada, and was required to report auditing results to the Congress in 2009, 2011 and 2012. In May 2009, Office of Auditor General of Canada submitted the first auditing report in accordance with Kyoto Protocol to the Congress. The following are some auditing conclusions about government's responding measures to the climate change:

The government's response plans on climate change in 2007 and 2008 did not include all the necessary information in accordance with Kyoto Protocol Enforcement Act. The missing necessary information included when the Carbon reduction measures took effect, some measures' statistical forms of expected Carbon emission reduction and whether the government implemented some measures on the expected date.

Environment Canada did not fully prove their expected Carbon reduction amount in accordance with Process Greenhouse Gases Emission Regulatory Framework. These bills of responding to the climate change exaggerated the reasonable Carbon reduction amount in accordance with regulatory framework during the period of Kyoto Protocol (from 2008 to 2012).

The government's bills of responding to the climate change were not fully transparent. For example, these bills did not reveal what the impact of some uncertain factors such as future economic condition will have on the expected Greenhouse gases reduction amount.

Although Environment Canada has made Canada GHG reporting system, they have no actual Carbon reduction reporting system about fulfilling every measures of annual climate change responding bills which is required in the Kyoto Protocol Enforcement Act. Environment Canada claimed that monitoring actual Greenhouse gases reduction total amount was not feasible in technology and economical effective. Carbon reduction could not be attributed to some concrete measures. However, Environment Canada could not explain why they could estimate expected Carbon reduction amount in advance, but could not survey actual Carbon reduction amount after all the measures were taken.

According to the contents and demands of annual climate change responding bills in Kyoto Protocol Enforcement Act, the Office of Auditor General of Canada's report made a proposal as follow: Report and monitor the expected Greenhouse gases emission amount of every measure in annual bills.

3.2. Practices of Carbon Emission Environmental Auditing in the U.S.

In 2009, U.S. Government Accountability Office reported what they had learned from EU's emission trading scheme and Kyoto Protocol Cleaning Development Mechanism which was taken as an

international Carbon-offset program [30]. U.S. Government Accountability Office found E.U was too soon to evaluate the plan's impact on emission amount, European Economy and investment in new technologies, although they established effective volume control and trading schemes to provide market for Carbon emission quota. The following points were emphasized in the report: 1) the importance of accurate basic emission for making plans; 2) the importance of regulatory certainty for entity which needs to be invested new technologies; 3) the key economic consequences of emission rights allocation methods.

Besides, GAO has released a report in allusion to the potential status of carbon offset in climate change legislation. The potential status of carbon offset in climate change legislation is a key issue that America is facing. The Congress audited multiple mechanisms of cost control of volume control and trading plan. In August 2008, GAO reported its discoveries: 1) current compensatory schemes are mutable; 2) it is hard to insure the credibility of compensation; 3) potential environmental and economic tradeoff shall be considered when using carbon offset to comply with volume control and trading system; 4) compensation lack of credibility will possibly harm the reputation of volume control and trading system. GAO suggested the Congress to make clear rules in the following parts: the item type which the supervised entity could compensate, and the internal ambiguity of the instruction and recovering of the offset item. Although the Congress is still deliberating on the policy of climate change, one of the draft laws about climate change put carbon offset aside, in order to deal with all the uncertainty the GAO have found.

Because U.S. and some other countries depend heavily on coal-fired power plants, and those plants emit plenty of carbon. Therefore, any technology that can reduce the emission of carbon will help much in dealing with the global green house gases. One of those promising technologies is called Carbon Capture and Storage (CCS), Carbon Capture and Storage captures the carbon emitted from power plants, sending them to the underground storage places and then injecting them into the geological structure and storing for a long time. GAO reported many key barriers in recent deploying of the Carbon Capture and Storage, including: 1) in the foreseeable future, existing power plant will occupy the largest share of utility carbon emission, but the cost of applying carbon capture and storage is high; 2) the responsibility and worry to the potential environment effect of carbon leakage during injecting. The suggestions of GOA include: 1) study plans on carbon capture and storage prepared by the Energy Department shall lay particular attention on the carbon capture of existing power plant; and 2) EPA shall make clear how to use their statutory powers to handle those potential key barriers.

4. Conclusion and Suggestions for Chinese Environmental Auditing Development

At present, informationized tool, represented by environmental auditing, together with imperative & control tool (carbon emission standard), marketized tool (carbon tax and emission right trade) are the three main tools in carbon emission reduction regulation. As a developing and new market-oriented country, China still use traditional regulatory tools as its major method to save energy and reduce emission, moreover, the method still needs to be strengthened sometimes. But at the same time, China also needs to accommodate to the change of the situation, using new regulation methods such as informationized tool to fill the defects of existing systems or to solve some new problems; China especially ought to learn from international experience, carry out environmental auditing, enhance the credibility of the carbon emission reduction disclosure, make use of the stakeholders' monitoring and accountability to overcome "government failure" or "market failure" in carbon emission reduction regulation.

In China, environmental auditing is gradually becoming an important part of government auditing, and has been used as a monitoring manner in the field of pollution abatement and energy saving and emission reduction. It has more and more individual features which are unlike other professional audit in audit coverage, audit approach, etc.[31] However, China has carried out environmental auditing for a very short

time, we shall promote the development of environmental auditing toward high-end "performance" and "regulation", and then boost the implementation of sustainable development strategy.

According to the fact that environmental auditing functions as an informationzied regulation tool, here are some suggestions for future development of Chinese environmental auditing:

Firstly, establish a scientific environmental auditing of carbon emission evaluation index system. According to the requirement for "focusing on building a resource and environmental auditing mode that fits our country conditions, and initially establish resources evaluation system of environmental auditing in 2012" proposed in the Auditing Development and Planning from 2008 to 2012, established by the National Auditing Office, the function of auditing and evaluating is to provide a signal or information, this signal or information proceed from the chain of responsibility, showing the policy performance, government performance, financial performance and project performance in carbon emission reduction. Based on the establishment of a scientific environmental auditing of carbon emission evaluation index system, Chinese future environmental auditing shall gradually remove its attention from the authenticity and lawfulness of the usage of foundling to the policy and management performance, promoting the development of environmental auditing toward the high-end of integrative performance auditing, paying attention to table a proposal on system, mechanism and institution, and playing an active role in the macro-management of carbon emission reduction.

Secondly, enhance the disclosure of carbon emission environmental auditing information. Information disclosure is the transmission of the results of environmental auditing, in the regulation of carbon emission reduction, the main deputy of the government, government departments and enterprises are principal parts of carbon emission reduction activities, according to the public governance theory and the Stakeholder Theory, the above principal parts' emission reduction performance shall be supervised by the public, taxpayer and other stakeholders, so that it can effect the reputation of the principal parts and help them to form the expected adaptability and learning behavior. Chinese future environmental auditing shall be based on the completeness of the environmental accounting principles, environmental auditing principles and cross-border environmental compensation system, take auditing announcement system as its carrier, design different ways of environmental auditing information disclosure in allusion to the different auditing and subjects, enlarge the coverage of auditing announcement, enrich the information content, make the auditing announcement become more pertinence, use the public stockholders' participation and monitoring to promote the energy saving and emission reduction actions of government and enterprises.

Thirdly, promote the perfection of environmental auditing accountability mechanism of carbon emission reduction. The purpose of accountability and feedback is to feedback issues, disposal considerations and suggestions on the rectification and reform to the policy makers and some related subjects, establish effective incentive and restraint mechanism, improve the disposal of problems and the perfection of the system. Chinese future environmental auditing shall consider the comprehensive effects and interference between validity and effects on the basis of knowing the ways in which the auditing and supervising have effected. Among them: validity is the strength of finding illegal actions during audit supervision and putting up audit decisions, transferring them to related department and putting forward auditing suggestions; while result is the consequences that audit decisions are implemented, the transferring of the auditing are handled and the suggestions are adopted. Auditing quality is not only reflected in confirming violations of law and discipline conditions, the more important part is that the auditing handling can be fulfilled. Through further improvement of accountability and responsibility mechanism of carbon emission reduction environmental auditing, we can turn environmental auditing accountability into legal accountability, personal accountability and consequences accountability, and thus enhance the credibility of environmental auditing.

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