

The research on the creation of domestic carbon market based on the AHP

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Abstract – This paper analyzes the present situation of the carbon market and aims to discuss how to construct our country's carbon market scientifically. With the energy conservation and emission reduction as a key consideration, this paper divided the issues of carbon market construction into different levels, and created the AHP model of carbon market construction. According to the comparison of the weight of the AHP model and the carbon market present situation, the author discuss how to improve the situation of our country carbon market construction, to realize the function of carbon market promoting energy conservation and emission reduction.

Keywords – AHP; Energy conservation and emission reduction; Carbon market

1. Introduction

The carbon emissions trading mainly refer to the agreement of greenhouse gas emissions trading, agreement by a party to pay the other party for greenhouse gas emissions credits (That is a certain amount of greenhouse gas emissions rights), it is a kind of emissions credits transfer in buyers and sellers. Carbon emissions trading come from Dales' Pollution rights idea, according to Dales' theory, economists proposed establishing carbon market. Due to the deterioration of the environment condition, with the addition of international pressure on China's carbon emission reduction, in the "12th Five-Year Plan for managing greenhouse gases", our government put forward that the unit of gross domestic product carbon dioxide dropped by 17% compared with 2010 by 2015, carbon market preliminary form. The control of green house gas emission has become a prominent problem in our country's sustainable development.

In the past few years, many scholars have carried out extensive research on the creation of carbon market, and present many ideas of creating China carbon market. Tianfei Yu (2007) put forward some suggestions on China's carbon market, such as the preparation for climate exchange based on cap-and-trade, to establish the relevant legislative, to speed up the financial innovation of CO₂ emissions derivatives and so on.^[1] Ben Ren and Fang Ling (2009) pointed out that perfecting the clean development

mechanism (CDM) and fostering carbon market are important strategic measures for our country to develop the low-carbon economy.^[2] Ji Yang (2010) analyzed of carbon emissions trading from the perspective of economics, he raised that our country needs to further explore and develop carbon market, he proposed six stratagems for developing carbon market in China. Such as determining low-carbon regulations as soon as possible, directly taking part in the secondary market and so on.^[3] Weijun Zhou, Jingde Sun and Chaoqun Zhang (2010) put forward that our country should perfect carbon system and develop a carbon financial system in the view of improving our carbon pricing position.^[4] Xiaowei Zhou (2011) believed that professional talents and intermediary organizations shortage restricts the development of China's carbon trading. Our country should encourage different regions to establish regional carbon market and perfect regional carbon market platform. Finally our country should foster a national carbon market in order to perfect our country's carbon market system.^[5]

The formation of the carbon trading market mainly comes from to solve the worsening environmental problems, Jie He (2008) think carbon emissions trading can promote the implementation of the national strategy of energy conservation and emissions reduction, it also can help the enterprise to form a new profit model, thus form a long-term, sustainable environmental publicity and education platform.^[6] China is cultivating and improving carbon market, however Nan Yu, Yuyan Yang and

Zhongqin Wang (2011) through the carbon trading market triple configuration effect, concluded that present domestic carbon market in essence from the ultimate goal of energy saving and emission reduction. Finally they also put forward some suggestions for improve the carbon market mechanism.^[7]

So this paper aims to study how to change domestic carbon market from energy conservation and emissions reduction, this paper also discusses how to create domestic carbon market scientifically. The author builds a hierarchical structure for the creation of carbon market with the AHP method, increases the weight of the effect of energy saving and emission reduction in carbon market construction, hires experts to fill in judgment matrix with the Delphi method, draws the relevant factors' weight on carbon market construction. Finally the author based on weighted order discusses how to construct the country carbon market reasonably for the sake of carbon market realizing the function of promoting energy conservation and emission reduction.

2. Carbon market construction AHP model

2.1. AHP method introduction and applicability analysis

Analytic hierarchy process (AHP) is put forward by T.L.Saaty, its core idea is having a complicated multi-objective decision-making problem as a system, and the target is decomposed into several goals or standards, and then decomposed into several levels which is index (or criterion, constraint), calculating through the qualitative index fuzzy quantitative method to order in single level and whole system. So AHP always be as target (index) and optimization decision-making system method.

Carbon market construction involves the complexes of government、financial institutions enterprises and other objects, and our country carbon market is still in the stage of exploration, there are many uncertainties. In conclusion, application shows that the AHP method provides an effective method for decision on Carbon market construction.

2.2. Carbon market construction hierarchical structure

According to the goal which is the construction of domestic carbon market, this paper breaks it down into different elements, then according to the subordinate relations puts all the elements together hierarchically, then form a hierarchical structure model. Table 1 is domestic carbon market construction hierarchical structure.

Table 1, domestic carbon market construction hierarchical structure

Target layer A	Criterion layer B	Factor layer C
Domestic carbon market construction(A)	energy saving and emission reduction effect (B1)	Cap and reduce carbon emissions(C1)
		Make carbon distribution system(C2)
	easing domestic emission reduction pressure effect (B2)	Establish carbon emission reduction registration system(C3)
		Improve the authority of the third party certification institutions(C4)
		Perfect carbon trading correlative laws and regulations(C5)
	avoiding domestic carbon loss effect(B3)	Strengthen the carbon market supervision(C6)
		Provide fiscal policy support enterprise reduction(C7)
		Constructing national carbon trading platform(C8)
		Provide financial fiscal policy support financial institutions innovative products and derivatives(C9)

2.3. Structure judgment matrix

After build domestic carbon market construction hierarchical structure, it came into the key step which is judgment matrix transferring qualitative analysis to quantitative analysis. Decision made comparison on the importance of factors of each level relative to the upper specific criteria or target between two, given quantity scale for different factors the comparison results of relative importance, made qualitative factor quantification, then used it to represent the proportion of the next level factors in a certain level factors.

This paper adopted Delphi Principle to identify the weight base on the 1-9 scale method of T.L.Saaty. At last the expert judgment matrix was obtained.

2.3.1 Judgment matrix A-B

For our country's carbon market construction, the author made comparison on three assessment criteria between two which were energy saving and emission reduction effect、easing domestic emission reduction pressure effect and avoiding domestic carbon loss effect, and the judgment matrix A-B= (bij) 3×3 was obtained

The paper increased emissions reduction effect compared with other criterion layer element to domestic carbon market construction weight in the judgment matrix A – B. Then it will affect the weight which is the importance of factor layer factors for the total target. The emission reduction effect of the factors were stronger, the weights were larger. Figure 1 is the specific instructions of principle.

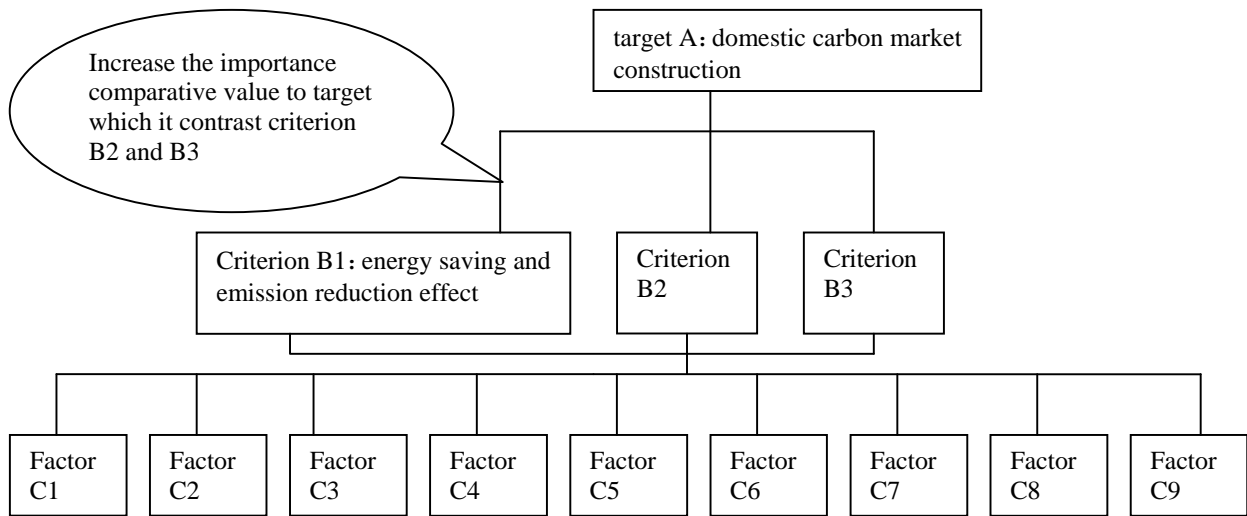


Figure 1, the specific instructions of principle

2.3.2. Judgment matrix B1-C, B2-C, B3-C

The author made comparison on the importance of nine factor layer factors for energy saving and emission reduction effect between two, and the judgment matrix $B1-C = (c1ij) 9 \times 9$ was obtained. Likewise, the author made comparison on the importance of nine factor layer factors for easing domestic emission reduction pressure effect between two, and the judgment matrix $B2-C = (c2ij) 9 \times 9$ was obtained. At last, the author made comparison on the importance of nine factor layer factors for avoiding domestic carbon loss effect between two, and the judgment

matrix $B3-C = (c2ij) 9 \times 9$ was obtained.

2.4. Calculation weight results

The author input the expert judgment matrix into yaahp v0.5.3 software, through the software operated the judgment matrix consistency ratio called CR value. Table 2 is the test results of Judgment matrix consistency. CR values are all less than 0.1, it shows that calculating weight have been through all levels of single sort and total sort consistency check and the calculation results can be used.

Table 2, judgment matrix consistency test results

	Judgment matrix	Judgment matrix consistency ratio(CR)	The weight To the target
Target layer - criterion layer	Domestic carbon market construction- Criterion layer Judgment matrix	0.0036	1
Criterion layer - factor layer	energy saving and emission reduction effect- Factor layer Judgment matrix	0.0042	0.6483
	easing domestic emission reduction pressure effect- Factor layer Judgment matrix	0.0030	0.1220
	avoiding domestic carbon loss effect- Factor layer Judgment matrix	0.0013	0.2297

After judgment matrix through the consistency check, the paper set expert weight, with weighted geometric mean method gathering experts' data. Finally the software operation out weight which is importance of different development carbon market factors for the total target, it is also the numerical scale of each factor's importance for Domestic carbon market construction.

From the weight comparison result of each factor, the weight of capping and reducing carbon emissions is largest, the weight is 0.1871. Second is to provide fiscal policy support enterprise reduction, the weight is 0.1793. The

weight of factor which is to make carbon distribution system is 0.1755. The weight of factor which is to improve the authority of the third party certification institutions is 0.1329. The weight of factor which is to provide financial fiscal policy support financial institutions innovative products and derivatives is 0.0983. The weight of factor which is to establish carbon emission reduction registration system is 0.0902. The weight of factor which is to Perfect carbon trading correlative laws and regulations is 0.0470. The weight of factor which is to constructing national carbon trading platform is also 0.0470. The weight of

factor which is to strengthen the carbon market supervision is 0.0426.

The calculation weight of the relevant factors is given in the form of bar chart, as shown in figure 2.

3. Conclusion

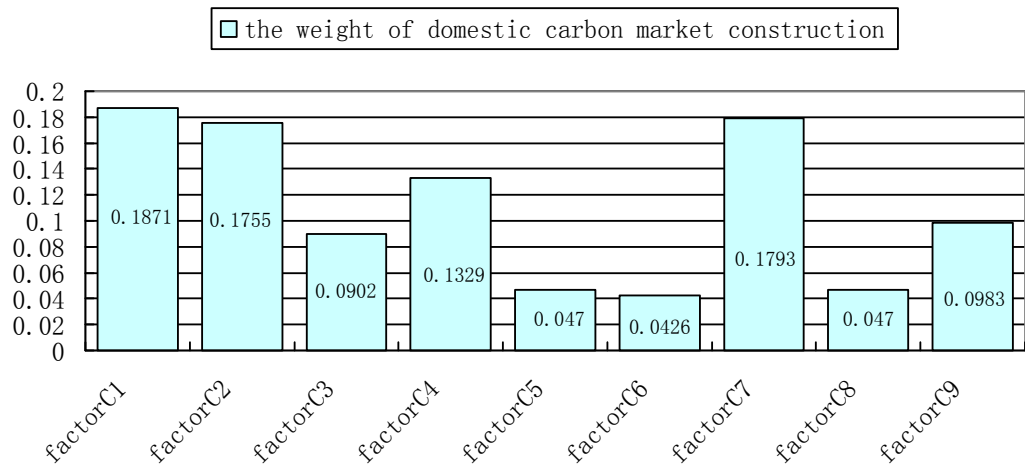


Figure 2, Domestic carbon market construction bar charts

Through the comparison of relevant factors' weight, first, the domestic carbon market construction point in present stage should be to cap and reduce carbon emissions as soon as possible. The government should provide fiscal policy to support enterprise reduction, and should make carbon distribution system. Second, through the increase to the financial organ policy support, financial institutions should be given full play to the value-added services and investment function. The third is to establish carbon emission reduction registration system and to improve the authority of the third party certification institutions, to ensure the smooth progress of carbon trading in China. The fourth is to change the present situation of our country which is to increase carbon exchanges blindly, to construct national carbon trading platform.

Facing the international emissions reduction pressure, to construct and perfect Domestic carbon market is the best way to respond to climate change. This paper aims to provide a kind of thinking method, for domestic carbon market construction, the effect of energy saving and emission reduction should be highly preferred. Using AHP method to solve the problem of domestic carbon market construction can avoid the problem of losing the trees for the forest. Then domestic carbon market will be constructed more reasonably. Not only can avoid the loss of carbon in China, more important is the realization of

carbon emissions and environmental protection

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