

# Research of System Building Basing on the Low Carbon Economy About Carbon Accounting for the Enterprise

Yao Liqiong<sup>1,2,a</sup>

<sup>1</sup>School of Management, Wuhan University of Technology, Wuhan, P.R.China, 430070

<sup>2</sup>School of Economics and Management , Ningbo University of Technology, Ningbo, P.R.China, 315211

**Abstract.** As global warming has become truth, is developing as a new economic model, The new economic development model has given rise to an important branch of environmental accounting, namely carbon accounting. At first, this paper discusses the carbon accounting theoretical foundation comprehensively, and then analyzes the environment of the construction of the carbon accounting system. The focus of the article is to build enterprise carbon accounting system, it covers the confirmation and measurement ,record and information disclosure of the enterprise carbon accounting on the way of low carbon economy , its core is the processing of carbon emission rights, information disclosure mode and content, etc.; The purpose of this paper is to build enterprise carbon accounting system which is suitable for China's national conditions, in order to provide certain reference and theoretical support for the low carbon economy development of our country.

**Key words.** Low Carbon Economy; Carbon accounting confirmation; Carbon Accounting System; Carbon accounting

## 1 The Development Background and Theory of the low Carbon Economy

### 1.1 The development background of the low carbon economy

Low-carbon economy was published by the British for the first time in energy white paper” in 2003 , the concept of low carbon economy was caused the wide attention and recognition by the international community, low carbon economy is recognized as the most effective and critical way to solve the problem of global climate . In the midst of the heavy industrialization, China promotes low carbon economic development model in all levels actively for seeking a new road to industrialization , at the same time, the domestic accounting profession also began to discuss the related problems of the enterprise carbon emissions and trading accounting under the background of the low carbon economy for China's national conditions quietly , Combining with the economic situation of home and abroad, this requires that we must change the traditional development model of the dependence on resource consumption and environmental costs excessively for economic growth.

### 1.2 Concepts and theories of Low carbon economy

Low carbon economy is an economic development form which is in order to build a win-win between the social

ecological development and environment protection. It reduces the high carbon energy consumption coal, oil, and greenhouse gas emissions as much as possible by the technical innovation, system innovation, industrial transformation, new energy development and other means under the guidance of the concept of sustainable development. The characteristics of low-carbon economy is to reduce emissions of greenhouse gas and construct economic development system of low energy consumption, low pollution , including low carbon energy system, low carbon technology and low carbon industry system. Low carbon energy system is to reduce carbon dioxide emissions by the developing of clean energy, including wind, solar, nuclear, geothermal energy and biomass energy instead of coal, oil and other fossil energy to(Ratnatunga 2012). Low-carbon technologies include clean coal technology (IGCC) and carbon dioxide capture and storage technology (CCS), and so on. Low carbon industry system include thermal power reduction, new energy vehicles, energy saving building, industry energy saving and emission reduction, circular economy, recycling, environmental protection equipment, energy-saving materials and so on.

<sup>a</sup> E-mail: yaoliqiong@163.com

## **2 The Concepts and Theories of Carbon Accounting**

### **2.1 The concepts of carbon accounting**

The development of low carbon economy has brought the development of carbon accounting; carbon accounting is the accounting system to promote deep integration and coordination between environment and economy development by reflecting and controlling the social environment resources on the basis of the traditional accounting. The latest research progress of carbon accounting is defined as a foreign currency as the main unit of measurement, mainly to the enterprise performance of the low carbon responsibility of saving energy and reducing pollutant emissions, its purpose is to help enterprises to realize energy conservation and pollution reduction. Carbon accounting mainly related to carbon emissions associated with carbon accounting information disclosure, risk or uncertainty management and strategic development, and so on.

### **2.2 The theories of carbon accounting**

#### *2.2.1 External theory*

For a long time, the space of carbon dioxide emission belongs to the category of public goods, externalization is obvious. Specification of carbon dioxide emissions is the main content of the carbon emissions trading(David 2008). Ultimately, the market capitalization, quantification approaches of emissions of carbon dioxide should be clear; it should become public goods and the resources which are gotten from paying a price in production and business operation process. It has reparability and exclusiveness in the process of using. The externalization of carbon dioxide is not only related to its amount but also because of not reasonable using by the human, the irrational economic structure and technology is not enough and so on.

#### *2.2.2 Property rights theory*

Property rights is very wide in the modern economics implication, it can be understood as a right which can chose the multiple uses of some economic goods through social force. It can be divided into two categories: private property and public property. Property rights theory is a kind of non-government interventionist scheme which solve the problem of externalizations by introducing the market mechanism, can be made through the trading policy of environment of economic management of emissions generally, the seller can sell pollution index from the reduction of pollution emission for the compensate of the external economy, the buyer buy the shortage of pollution index because of not to reduce pollution by the regulation, in order to realize the enterprise private cost close to its social cost, can achieve the optimal allocation of environmental resources. It is not hard to imagine that the result is the destruction of the

resource, waste and excessive development if you can't definite or guarantee property rights clearly. If carbon resources rights are clear and can be transferred, carbon resource cost and value can be detailed evaluation measured; also, resources can be allocated effectively.

#### *2.2.3 Sustainable development theory*

Thought of Sustainable development is the long-term development of human society; it reflects a reflection of the relationship between the development of human beings and natural environment resources. Sustainable development is proposed by the world commission of environment and development in the report of "our common future" in 1987, the definition of "sustainable development" is to satisfy the need of modern people without hurting the ability of future generations to meet development needs in generally(Gregg 2002). Enterprises must take the environment effects from the production and business operation activities into account in the process of sustainable development, and measure, reflect and control the environmental resources, in order to provide services for improving the environment, using resources rationally and promoting the sustainable development of the enterprise. Implementation of Carbon accounting will affect the enterprise decision-making and economic benefits, the relevant transaction will also affect the enterprise's financial position, operating results, in order to meet the requirements of information users to understand the carbon accounting information, it requires companies have to provide the information system of carbon accounting information .So, the sustainable development theory is important for deepening the understanding of the "low carbon", as well as the formation and development of carbon accounting.

## **3 The Relationship Between Low Carbon Economy and Carbon Accounting**

### **3.1 The relationship of the unity and opposites**

The opposite of low carbon economy and carbon accounting is that low carbon economy is a description of development concept, but carbon accounting is a new form of economic development for management activities, which is material; The unity of them is mainly manifested in the consistency of the target , the main goal of low carbon economic model's is to respond to climate change and energy security, so as to promote the sustainable development of society and economy, carbon accounting is based on how to compensate the cost of natural resources and the accounting , its main purpose is to use accounting to reflect the problem of environment and resources, and make the environment and resources information to influence people's behavior. So target of carbon accounting is consistent with the low carbon economy. Visible, low carbon economy and carbon accounting attaches great importance to the ecological environment and material circulation rule, reasonable development and utilization of resources, efforts to

improve social benefit and environmental benefit, so as to achieve sustainable development. to achieve coordination between man and nature system.

### **3.2 low carbon economy is the theoretical basis to realize carbon accounting**

Low carbon economy is a concept and mode of sustainable development which correlates energy, environment and economy. On theory, low carbon economy is a kind of development, and accounting is a kind of management activities to reflect and control the enterprise economic activity .According to the development of economy, it can improve and enrich the traditional theories and methods, in order to reflect and control the consume energy and its external environment damage from enterprise production activities, as to make the enterprise accounting can reflect the economic activities, and assess their effectiveness fully and truly. In fact, Environment and resource factors must accounted in the economic activity of enterprise, which requires the accounting system to reflect. The establishment of low carbon economic development model provides the necessary theory preparation and practice basis for carrying the environmental resources and carbon emissions into the accounting system.

### **3.3 carbon accounting is the necessary means to realize low carbon economy**

Low carbon economy model is asked to reduce dependence on natural resources; we can not only achieve the efficient use of energy but should pay attention to the protection of the ecological environment in the process of social and economic development. As to realize the sustainable development of economy. As the leading force of the social production, enterprises are the body of the quantity, and the development of low carbon economy. To build and implement the feasible carbon accounting system is to apply quantitative carbon accounting information to fulfill its obligations to the environment to the enterprise, the evaluation of environmental responsibility, To evaluate whether the enterprise can reduce energy consumption, reduce pollution emission and improve efficiency is the objective requirement of low carbon economy development, also is the essential means to realize low carbon economy.

## **4 Construction of Carbon Accounting System**

### **4.1 Environmental analysis of building carbon accounting system**

Carbon accounting is from the environmental accounting. Its development can not leave from a certain macroscopic environment and microcosmic environment, macro environment is primarily policy factors, the micro environment factors are from the market, before the

constructing of carbon accounting system, we have to analysis policy environment and market environment to prepare for it well.

#### *4.1.1 Macroscopic environment*

The clean development mechanism is our country to participate in most project mechanism, the main content is: in the Kyoto protocol, developed countries carry out the project level with developing countries by providing funding and technology, they make project investment which not only conform to the requirements of the sustainable development policy, but have greenhouse gas emission reduction effect in developing countries. In return to get some or all of the emissions reductions for investment project ,as a part of its emissions reduction obligations, the lines is defined as a certified carbon emission reductions in the clean development mechanism (CDM).

Carbon emissions trading mechanisms refers to that countries transferred its carbon emissions reduction obligations which is over fulfilled to another country directly by trading. It is from annex 1 in the "Kyoto protocol", including the "emission reduction unit", "emission reduction certified", "distribution of the number of units", "removal of units" such as carbon reduction unit certified(Larry 2013).

Joint performance of the mechanism, is refers to the developed countries fulfill project based in return for carbon emission through trading in the transitional developing countries. Carbon emissions produced in the joint performance of the project is called reduction unit.

#### *4.1.2 Micro environment*

Carbon markets are the soil of accounting for growing, the development of accounting can not leave from the market environment, carbon emissions trading market is important in the development of carbon accounting market environment. In order to lay a foundation for the later construction enterprise carbon accounting system. We must understand the relevant market environment. For the moment, in carbon emissions trading market, compliance of trading market is given priority; voluntary compliance trading market is minority. According to the report by world bank in 2011 , From carbon emissions trading volume and the trading amount in the global main large carbon emissions trading market , the carbon emissions trading market dominant is based on the quota of carbon emissions trading, the trading of several large carbon emissions trading system is in large number. Carbon emissions trading on the basis of the project is mainly based on CDM project of certified carbon emissions, it makes amount of carbon emissions trading on the basis of the project, most of the joint project implementation mechanism of emissions trading unit and the number of carbon emissions trading market is little voluntarily(Janet 2008). Based on the above analysis, you can see that global carbon emissions trading market has begun to take shape, it is feasible to obtain the fair value of the carbon emissions.

## 4.2 Confirmation of carbon accounting

### 4.2.1 Confirmation of measurement principle

To distinguish the type of market. By above knowable, at present, carbon emission rights have two different types of trading markets mainly, one is a mandatory compliance, the other is a voluntary compliance trading.

To distinguish the type of transaction. Because there may be a variety of transaction type, so we cannot treat as the same even in the same transaction market. even if there is a mandatory compliance, but type can be based on the quota, may also be based on the project (Jonatan 2011).

To distinguish the purpose of use. Carbon emission rights obtained by enterprises are for different purposes, for different purposes, the choice of enterprise must be different. Even if the market and the transaction type is same, but because of different uses, the accounting measurement still have differences, so we also need to distinguish purposes.

### 4.2.2 To confirm the measurement content

Because of the different nature of trading, the measurement of carbon emission rights is also different, as mandatory compliance market transactions for example, make division according to the different combination of the transaction type and uses.

① Transaction type: on the basis of quota, use: emissions plan for private use. Confirm the measuring specific content as shown in table 5-1.

Table 1 The confirmation of measurement based on quota trading plan for private use	
Project	specific content
Initial confirmation	Carbon emissions that are acquired from the government's free accounting treatment; From a government auction for carbon emissions or purchase from the secondary market on the basis of quota of processing of carbon emissions
Subsequent measurement	Emissions of greenhouse gases yes accounting: carbon emission rights value changes in accounting: amortized during the period of accounting: final carryover and cases submitted to the accounting treatment: enterprise accounting change hold carbon emissions purposes

② the transaction type: on the basis of quota, application: permits plans to sell. Confirm the measuring specific content such as table 5-2

Table 2 The confirmation of measurement based on quota trading plans to sell	
Project	specific content
Initial confirmation	Carbon emissions that are acquired from the government's free accounting process, from the government by auction of carbon emissions accounting treatment, from the secondary market to buy based on the quota of the accounting treatment of carbon emissions
Subsequent	Carbon emissions accounting value changes,

measurement	to sell carbon permits to accounting, the accounting treatment of the final presentation, enterprise change hold carbon emissions accounting purposes
-------------	---

③ Transaction type: on the basis of the project, use: emissions plan for private use. Confirm the measuring specific content as shown in table 5-3.

Table 3 The confirmation of measurement plan to use based on project	
Project	specific content
Initial confirmation	Through project cooperation in carbon emissions accounting, on the secondary market to buy based on the project of carbon accounting
Subsequent measurement	The same as ①

④ Transaction type: on the basis of the project, use: permits plans to sell. Confirm the measuring specific content as shown in table 5-4.

Table 4 The confirmation of measurement plan to sell based on project	
Project	specific content
Initial confirmation	Through the project cooperation in carbon emissions accounting confirmation, on the secondary market to buy based on the project of accounting confirmation.
Subsequent measurement	The same as ②

## 4.3 Accounting records of carbon

### 4.3.1 Account Settings

Based on the above analysis, when the accounting account Settings to make it satisfy the requirement of conventional financial accounting work, and meet the needs of the carbon accounting work. When in the specific design, can from the following aspects:

① Add general ledger subjects "carbon emissions", in view of the carbon in the new situation, new business accounting and management of the new requirements set, it can reflect the carbon emissions of its specific subject, and can judge the implementation of its environmental responsibility, in a timely manner so as to take measures in a timely manner to improve governance.

② Add detail course, set under the "carbon emissions" subject "personal use" and "sell" two subsidiary subjects, according to the different USES of company carbon emission rights classification collection summary.

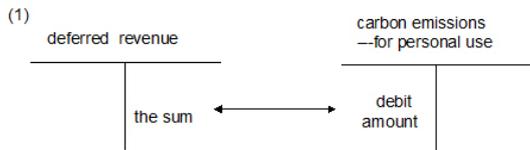
### 4.3.2 Accounting treatment

As mandatory compliance market transactions for example

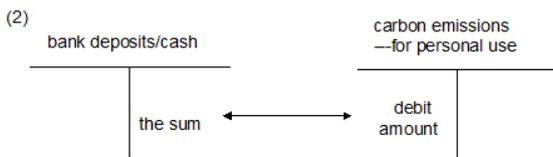
① Transaction type: Based on the quota, application: emissions plan for private use

Carbon emissions way free from the government. In accordance with the fair value as obtained confirmed that involves accounting account for "carbon emissions - for

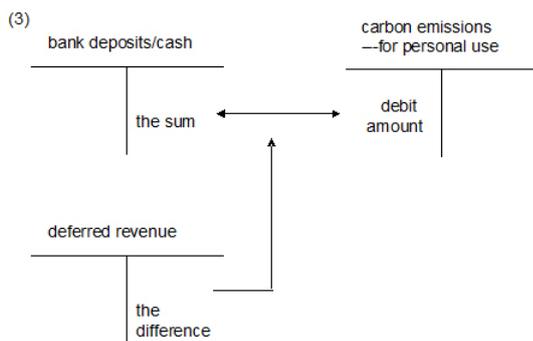
personal use" and "deferred revenue", processing is as follows:



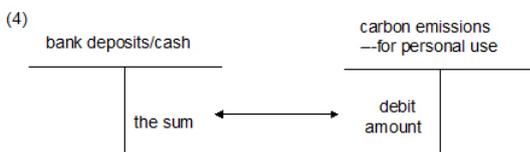
Carbon emission right can be got from government by auction. When the sale cost is greater than the fair value, it is confirmed by auction cost. Processing is as follows:



When auction cost < fair value, at fair value, involving accounting account again, borrowers' difference "deferred revenue", and a process is as follows:

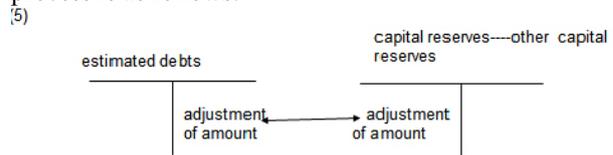


Carbon emissions from the secondary market to buy. Carbon emission rights obtained by this way, the purchase cost is equal to the fair value, this is in the market of fair trade both parties of a voluntary deal price, according to the purchase cost can be confirmed, involving accounting account for "carbon emissions - for personal use" and "bank/cash on hand", processing as follows.

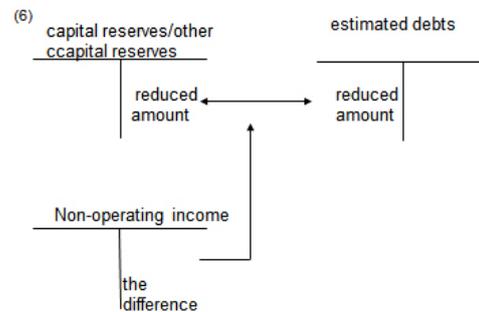


Deferred revenue. Deferred revenue according to adjusted the book balance of the processing, the non-operating income at the current, the premise according to the use of carbon emission rights plan, and adjust the early spread of deferred earnings. When the deferred revenue is a credit balance, processing as "deferred revenue" debit, "non-operating income" lenders, when the deferred revenue for the debit balance, "non-operating income" debit, "deferred revenue" lenders. Greenhouse gas emissions. In accordance with the fair value of the liabilities, confirm the enterprise cost, fair value for

emissions, and specific treatment for "manufacturing cost/management fee/cost of sales/production costs, such as "debit," estimated debts lenders. Adjustment is expected liabilities, according to the fair value of the carbon emissions(Kenneth 2004). The fair value increases, the estimated debts to adjust its book value, capital reserves also adjust accordingly; the specific process is as follows:



Fair value decrease, the capital reserves to offset (if the preexisting for appreciation and confirmation), capital reserves enough write-downs, would need to be accounted for as non-operating income account, the specific process is as follows:



The final balance sheet date accounting. The final accounting, follow the principle of first in first out, return to the government carbon emissions, and the actual emissions equivalent to the final at the same time carry forward capital reserves and carbon emission rights impairment provision, should correspond to actual emissions.

②Transaction type: on the basis of the project, use: emissions plan for private use

Emissions through project cooperation, in accordance with the fair value can be confirmed as obtained (usually can choose acquisition cost), involving accounting accounts for "carbon emissions - for personal use" and "bank deposit cash/library", processing is as same as (2)

Carbon emissions in the secondary market to buy, and initial recognition through project cooperation in confirm the identity of the practice of carbon emissions. Described in the subsequent measurement and (1) accounting, no longer here.

③ Transaction type: on the basis of quota, use: permits plans to sell. Company plans to sell carbon permits to accounting, method is similar to in stock, but with inventory and not identical, to establish accounting account for "carbon emissions - for sale". "Is the explanation of China's accounting standards for stock inventory is refers to the enterprise in everyday activities held for the sale of finished goods or commodities, in the production process in the product, in the production

process or provide labor services process consumption of materials, materials, etc." The explanation shows that companies hold for plans to sell carbon permits, the basic characteristics and the definition of inventory, but on the other hand, from the definition of inventory, inventory is a physical form, in contrast, carbon emissions, is no physical form. In conclusion, if you plan to sell carbon permits to directly recognized as the inventory, it is not appropriate, you should add "carbon emissions - sell" course, confirm measurement of carbon emissions. Carbon emissions way free from the government. In accordance with the fair value as obtained confirmed that involves accounting account for "carbon emissions - sell" and "deferred revenue", processing is as same as (1)

Carbon emissions from the government by auction. When the auction cost or fair value, confirmed by sale cost, involving accounting account for "carbon emissions - for personal use" and "bank/cash on hand", processing is as same as (2)

When auction cost < fair value, at fair value, involving accounting account again, borrowers difference "deferred revenue", a process is as same as (3)

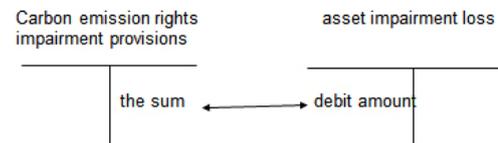
Carbon emissions from the secondary market to buy. Carbon emission rights obtained by this way, the purchase cost is equal to the fair value, this is in the market of fair trade both parties of a voluntary deal price, according to the purchase cost can be confirmed, involving accounting account for "carbon emissions - for personal use" and "bank/cash on hand", processing is as same as (2)

Subsequent accounting treatment is mainly related to the carbon emissions of self-use value change, can be divided into value-added and impairment of two cases. Carbon emissions rise in value, if the initial measurement involves a deferred income, carbon emissions and the book value of the deferred income increase, processing for the increase in "carbon emissions - for" debit, "deferred revenue" credit, if the initial measurement without involving deferred income, processing for the "carbon emissions - for" debit, "capital reserves, other capital reserve" lenders, in addition, still need to write down impairment provision if there is a provision for impairment loss of the original; Carbon emission rights impairment, if initial measurement involves the deferred income, when processing to reduce the forehead, "deferred revenue" debit, "carbon emissions - for private use" credit, if the initial measurement without involving deferred income, processing to reduce the amount of the asset impairment loss "debit," carbon emission rights impairment provision "lenders, value-added have previously included in the capital reserves, need to offset capital reserves.

Deferred revenue. Deferred income according to adjusted the book balance of the processing, the non-operating income at the current, the premise according to the use of carbon emission rights plan, and adjust the previous share of deferred income, treatment as "deferred revenue" debit, "non-operating income" lenders. Impairment test. Plans to sell carbon emissions if made free from the government or auction, when cost is < the fair value, to compare costs and net realizable value of carbon emissions, according to both the smaller adjust the

book value. That there are two kinds of circumstances, when the entry value > net realizable value, the difference between the two confirmed as carbon emission rights impairment provision, involving accounting account for "asset impairment loss" and "carbon emission rights impairment provision", the process is as follows:

(7)



When the entry value < net realizable value, the two cases, one if the original impairment provision, should be in the provision of the amount of the impairment of a second if the original is made of, does not make the accounting treatment. Plans to sell if carbon emissions from the secondary market to buy or obtained from the auction, when purchase cost or fair value, are "lower of cost and net realizable value" for impairment test. , same as above is divided into two cases. The sale of carbon emissions. Plans to sell carbon emissions in accordance with the sale income amount is recognized as the other business income, namely debit "bank/cash", "other business income" is credited to account the corresponding cost, shall follow the principle of first in first out, and the specific processing is: borrow other businesses "cost", credit "carbon emissions - for sale", if there is provision for impairment loss, debit "other business cost", "carbon emission rights impairment provision", credit "carbon emissions - for sale".

## 5 Conclusion and Prospect

With the development of low-carbon economy, the importance of carbon accounting has been self-evident, theory and practice in our country are making unremitting efforts. In this chapter, from the perspective of the enterprise accounting practice case carbon, carbon accounting practice processing has carried on the concrete discussion, and the future application of carbon accounting are further analyzed. Believe that through the joint efforts of theory and practice, the theoretical framework and method of carbon accounting system will be constantly to improve and develop, thus for enterprise development provide effective guidance of carbon accounting practice.

## References

1. Jane k T.D.Ratnatunga, Kashi R. Balachandran. Carbon Business Accounting: The Impact of Global Warming on the Cost and Management Accounting Profession[J]. Journal of Accounting Auditing and Finance. 2012 (2): 333-355

2. AnsKolk, David Levy, Jonatan Pinkse. Corporate Responses in an Emerging Climate Regime: The Institutionalization and Commensurable of Carbon Disclosure[J]. *European Accounting Review*, 2008(6): 175-183
3. Tristram O.West, Gregg Marland. A synthesis of carbon sequestration, carbon emissions, and net carbon flux in agriculture: comparing tillage practices in the United States[J]. *Agriculture, Ecosystems and Environment*, 2002(7): 85-92
4. Ans Kolk, David Levy, Jonatan Pinkse. Corporate Responses in an Emerging Climate Regime: The Institutionalization and Commemoration of Carbon Disclosure[J]. *European Accounting Review*, 2011 (4): 719-745
5. Janet Ratnatunga, Stewart Jones. An Inconvenient Truth about Accounting: The Paradigm Shift Required in Carbon Emissions Reporting and Assurance[C]. American Accounting Association Annual Meeting, Anaheim CA, 2008(10):89-93
6. Larry Lohmann. Toward a different debate in environmental accounting: The cases of carbon and cost-benefit[J]. *Accounting, Organizations and Society*, 2013(34): 499-534
7. Kenneth R. Richards, Carrie Stokes. A Review of Forest Carbon Squestration Cost Studies: A Dozen Yeas of Research[J]. *Climatic Change*, 2004(63): 41-48