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# The 3<sup>rd</sup> International Accounting Conference and The 2<sup>nd</sup> Doctoral Colloquium

## Accounting Research Contribution to Society :

## Bridging the Gap Between Theory, Research & Practice : IFRS Convergence and Application

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**Proceeding**

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**CARBON COST MANAGEMENT: DISPARITY BETWEEN CONCEPTS AND  
PRACTICES**

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# **CARBON COST MANAGEMENT: DISPARITY BETWEEN CONCEPTS AND PRACTICES**

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## **ABSTRACT**

The emergence of the idea of carbon trading and system of carbon emissions reduction originated from global concerns about climate change and rising global temperatures in the world. Through the Kyoto Protocol, carbon emission reduction concepts have been arranged in such a way through the ratification of the protocol. Consciousness of individual, business, and countries to have a commitment to reduce carbon emissions becomes a key factor. For business entities, carbon cost management becomes a strategic choice to maintain the company in the future through carbon emission efficiency. Companies have a lot benefits by reducing of production cost based on the carbon efficiency of carbon emissions; for example, they have carbon-friendly products and more accepted by consumers. This study describes the extent to which awareness of companies on the idea of the carbon-emissions efficiency through the concepts of carbon cost management, and the extent to which they implemented the concepts. Specifically, the objective of this study is to examine the extent to which the disparity between concept and implementation of Carbon Cost Management.

The variables in this study are the concepts of carbon cost management and the practices of carbon cost management. Carbon cost management concepts are concepts or ideas about the efficiently carbon emissions management in order to obtain low-cost emissions. Concepts are referenced from the research and focus group discussions which were conducted by Ratnatunga (2007b, 2010). While, the variables of carbon cost management practices are the concepts about the carbon cost management that is practiced by companies in thier production systems / management accounting system. By using paired sample t-test, the hypotheses was tested.

The main conclusions of this study is that there is a disparity between concept and practice of carbon cost management. Concepts and expectations initiated by researchers, professionals and practitioners cannot be implemented fully within the scope of the company. These concepts are classified into two factors, i.e. production factor and controlling factor. Factor of production is the most important factor to consider if the company wants to develop a strategic system of Carbon Cost Management.

*Key Word: Carbon Cost Management, Carbon Trading, Climate Change, Carbon Cost Accounting, Carbonomics.*

## **I. INTRODUCTION**

### **Background**

The influence of global warming on human life has led to a series of serious action from the world community as efforts to prevent global warming effects more broadly. Kyoto Protocol, which has been signed and ratified by most countries in the world are key to change for the world community. The protocol stated that the protocol ratifying governments, enterprises and consumers should immediately make efforts to a behavior change toward a new economic concept, i.e. the era of environmental economics which is called as "Carbonomics" by Ratnatunga (2008, p.1). Carbonomic era ideas will be able to become the motor of environmental protection and save the world from the problem of increasing global warming. The implications of the adoption of the Carbonomic concept will affect on the socio culture development, professions and economic model.

Another recommendation of the Kyoto Protocol is the recognition of carbon trading schemes (Callon, 2009, Ratnatunga; 2007a). This trade model can be described as follows: companies initially did a deal (most likely through the regulation of the government) about how much Carbon Dioxide (CO<sub>2</sub>) to be generated by their production (the Cap). If certain firms in producing goods or services produced CO<sub>2</sub> emissions less than the maximum limit (the cap), they have a credit score, on the contrary, if a particular company exceeds the threshold limit CO<sub>2</sub> emissions, then they can buy credits from companies that have emissions below the threshold. The amount of accumulated carbon emissions Limit within a region should not exceed the amount of maximum accumulation limit that has been established (Ratnatunga, 2007a).

The important meaning of the implementation of carbon trading in accounting is the emerging of the idea of controlling carbon cost, termed as carbon cost accounting (CCA), in the production. Companies need CCA management to control carbon emissions due to their production activity. If carbon emissions can be controlled to limit the permitted threshold, then it is a strategic advantage for future product development.

The issue of the CCA is a phenomenal thing for sustainable living, considering the impact of carbon emissions which are not controlled can cause severe environmental damage. Therefore, research on the CCA is an interesting issue for economic development and ecological sustainability. Some researches on the impact of the Kyoto Protocol and carbon cost management have been conducted by several researchers. Löschel and Zhong Xiang Zhang (2002) examine the impact of the Kyoto protocol on environment conservation due to the unwillingness of US to ratify the Protocol. But their results showed that the Kyoto Protocol contributed significantly to the reduction of gas emissions in industrialized countries. Driesen (2007) examines the impact of carbon trading in the international market for sustainable energy development. The result of the study done by Driesen (2007) show that the international carbon market contributes very little to the development of sustainable energy.

With the progress of global warming and carbon trading, companies need a carbon cost management (CCM) to be able to maintain the existence of their products in the global market who want carbon-friendly products. Only by having a strategy based on the achievement of economic and ecological balancing, the company will survive in the global market.

The problem is the concept of carbon trading as an effort to reduce global carbon emissions has not been widely recognized in all countries. That is because the carbon trading system does not yet have a clear concept, especially in terms of recognition of carbon transactions between companies or between countries. In more micro areas, firms as business entities are also have not yet a clear concept of how to manage the cost of carbon in their primary production process.

The strategic issues of carbon cost management (CCM) has been developed by Ratnatunga (2007a, 2007b, 2008) through a series of his research and focus group discussions in various countries, including Indonesia. The results show the importance of looking at strategic issues for maintaining the company's existence in the future, including the mechanisms of global carbon emissions reductions (2007a), the strategy of costs reduction and increase revenue through the carbon cost management (2007b), strategic issues of carbon cost management (2007b), and the strategic concepts in the field of business policy, human resources management, product marketing strategic and international business strategy which has an impact on carbon management (2008).

For companies, initial step that need to be put up in the era of low-carbon emission is the development of carbon cost management practices. Standard formulations should be considered to create a management control system based on the behavior of carbon efficient. Although the research on the carbon cost management conducted by Ratnatunga (2008) carried out empirically, but it is still limited exposure to ideas and concepts. Therefore, the test of the implementation of those concepts is still necessary to know the clear picture about the extent of readiness of companies in the carbon era through the

carbon cost management. The important contribution of this research is to provide images concerning the important concepts and implementation of carbon cost management.

### **Problem Formulation**

The emergence of the idea of carbon trading and system of carbon emissions reduction originated from global concerns about climate change and rising global temperatures in the world. Through the Kyoto Protocol, carbon emission reduction concepts have been arranged in such a way through the ratification of the protocol. Unfortunately, the Kyoto Protocol does not have a strong influence due to the absence of strong states, such as the U.S., in ratification of the protocol. Meanwhile, serious action to save the world from the threat of global warming must be done immediately.

Consciousness of individual, business, and countries to have a commitment to reduce carbon emissions becomes a key factor. For business entities, carbon cost management becomes a strategic choice to maintain the company in the future through carbon emission efficiency. Companies have a lot benefits by reducing of production cost based on the carbon efficiency of carbon emissions; for example, they have carbon-friendly products and more accepted by consumers.



This study describes the extent to which awareness of businessmen on the idea of the carbon-emissions efficiency through the concepts of carbon cost management. In addition, this study would examine the extent to which companies implement these concepts in the company. Based on the motivation of the research, the research problem can be formulated as follows:

1. How companies respond to the theoretical concept of carbon cost management?
2. The extent to which companies practice the concept of carbon cost management?
3. Is there disparity between concept and implementation of carbon cost management?

### **Research Purposes**

Based on the formulation of the problem mentioned above, this study aims to determine the extent to which companies respond to the concept of the proposed carbon cost management, and to know how far they practice these concepts. Furthermore, this study also aimed to determine whether there is disparity of concepts and implementation of carbon cost management in the firms.

## **II. THEORETICAL FRAMEWORK AND HYPOTHESES**

### **Carbon accounting and strategic factors in management accounting**

The impact of carbonomics idea has served in various professions, including the accounting profession. This is because the field of accounting, particularly management accounting, finance and audit, whether directly or indirectly affected by such Carbonomics era. Conversely, strategic readiness in the field of management accounting practices will encourage the acceleration of Carbonomics lifestyle readiness in the company.

In the next stage, the carbon accounting era will evolve if it is supported by a variety of accounting systems and adequate engineering. An idea to connect the product with the efficiency of CO<sub>2</sub> need to have the support and concern seriously, because an idea in the efficiency of CO<sub>2</sub> emissions is an action to rescue the world (MacKinzie, 2009). This is the significance meaning of carbon accounting in the profession development and accounting engineering in the world situation which is struck by the anxiety caused by global warming.

A key element in Carbon accounting is the efficiency of greenhouse gas emissions, especially CO<sub>2</sub> (the largest gas generated by human activities), associated with the manufacturing and supply of goods and services. Research of Ratnatunga (2007) conducted during 2003 to 2007 also concluded that important factors associated with the efficiency of carbon, such as regulations from the government or the authorities that regulate the accounting standards of carbon trading system application.

Issues about carbon cost management will have implications on other strategic issues related to management accounting. Once the carbon cost of a product is known, a variety of strategic issues in the field of management accounting will be developed. In this case, including CO<sub>2</sub> emission efficiency in the use of raw materials, labor costs, factory overhead costs, environmental overhead costs, and issues related to carbon cost management, corporate governance, Carbon accounting standard and audit strategy (Ratnatunga, 2007). Other strategic issues can also be developed such as carbon marketing strategy, pricing strategy and the modeling of demand for carbon emission credits.

Related to the field of accounting, carbon cost management is a new era of economic transactions idea based on the ecology, namely Carbon Accounting. Like the implications

of the concept of carbon cost management, the implementation of carbon accounting will have broadly implications in the accounting profession and the strategic issues of carbon accounting, particularly for countries that have implemented the concept of carbon trading in the era of Carbonomics.

But the acculturation process of economic behavior based on ecology can't be quickly applied in the field of social accounting, also it can't give a broad effect on other areas. Acculturation requires the readiness of knowledge, technology, legal justification, and especially in the conventional business practices. Therefore, in the first stages of development carbon accounting era in developing countries, especially in Indonesia, it takes an engineering of management accounting as a stimulant for the carbon accounting application. Based on those ideas, then the problem needs to be studied is the extent to which the application Carbonaccounting concept is supported by the readiness and willingness of government and business practitioners

### **Carbonomics and Carbon Cost Management**

One of the recommendations of the Kyoto Protocol is a system of emissions threshold and carbon trading. Companies need new ideas and technology to implement the carbon trading under the Protocol. Central issue in this carbon trading is the amount of carbon that can be rationalized and the model of carbon trading markets that could affect business strategy, financial performance and corporate value. To be able to lead to the idea of carbon trading, it is needed a good understanding of the elements of business accounting and finance, such as capital, demand and supply of carbon credits, the business value of risk management, capital allocation, and even if possible is the financial reporting standards that are specifically related with carbon transactions. In addition, issues

concerning taxes related to the carbon emissions and carbon trading needed to be considered.

Today, in Europe, the main focus is financial reporting and taxation. The research in the field of carbon accounting, which focuses on the development of the accounting profession and accounting management, including market assessments and performance management, is very little. Provisions regarding the mandatory or voluntary reporting of carbon cost management are also an important issue, which is depending on a country and industrial competition. Imbalance in the consumption of economic resources in the perspective of environmental sustainability is not only due to purely economic perspective, but also due to the low level of awareness for the prevention of Global Warming.

There are five gases that can cause global warming, that are carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, and HFC. Kyoto Protocol give a threshold for the presence of these gases in the air, especially as Carbon Dioxide which directly related to the human and economic activity. Associated with the production process, the Kyoto Protocol encourage investment in low CO<sub>2</sub> emissions technology, the calculation of cost production and the imposition of carbon emission costs to customers based on the regulation.

Ratnatunga (2007a, 2007b) has conducted research involving 638 respondents from 11 countries. The study which began in 2003 until 2007, generating fresh ideas related to the reduction of carbon emission for business entities and individuals, as well as strategic issues in the field of carbon cost management (Table 1).

The key factors in the carbon cost management is the control of cost and carbon emission in production processes, especially CO<sub>2</sub> (the largest gas generated by human



activity). Therefore, the concept of carbon cost management as proposed by Ratnatunga (2007a, 2007b) is a strategic issue that needs to be observed to apply in business practices.

### **Previous research**

Previous studies that describe the extent to which carbon cost management practices are still very rare. Ratnatunga (2007a) acknowledges that research in the field of carbon cost accounting is still very rare. Accounting research related to carbon emissions is still limited in terms of financial accounting (2007b). Therefore Ratnatunga (2007b) during the mid-year 2003 conducting research related to the impact of cost accounting considerations on the activity of carbon emission reductions. This study is proof of the inverse of the research conducted by Ratnatunga (2007b), i.e. by examining the extent to which the implementation of the concepts of the Carbon Cost Management in the company.

Recognized or not, studies related to carbon accounting at least have given the strategic idea of development of the carbon cost accounting concept. Driesen (2007), for example, examines the impact of carbon trading in the international market for sustainable energy development. The result of the study done by Driesen (2007) shows that the international carbon market contributes very little to the development of sustainable energy.

In Indonesia, some research on the CCA has been done before by Jafar S., and Lisa K., (2009a, 2009b). The result of the first study (2009b) shows that management control systems, production management, and corporate governance practices are important variables that affect the practice of carbon accounting. A second study (2009a) showed that Environmental Paradigm affected on the Carbonaccounting Paradigm and Carbon Accounting Standards.

Unfortunately, in accounting, there is still very little research that investigates issues of the CCA, even more about the carbon cost accounting reporting model, and the impact of carbon cost accounting data for decision making. Epstein J., Marc, and Martin Freedman (1994); Hackston, D. and M. J. Milne, (1996); Salomone, Roberta and Giulia Galluccio, (2004); and Jafar S., and Dian Tanila K., (2009) has conducted research that identified a variety of environmental information reported in the capital market; the factors that affect the environment; and the impact of disclosure of environmental reporting for the value of the company in the capital market. In general, some researchers above make recommendations about the importance of research that explores the model of environmental data reporting in the annual report. The problem is, there hasn't been any general agreement on the environmental data display model integrated with the financial reporting. This happens because, (1) in some countries, enforcement of environmental reporting is different, some are voluntary and some are mandatory as in some European nations, (2) lack of similarity measures between environmental performance and financial performance. Therefore, the importance of environmental reports (CCA) is still internally for management purposes.

### **Hypotheses**

The Kyoto Protocol has provided a general statement about the decreasing of amount of Greenhouses Gases (GHG) emissions, including CO<sub>2</sub>. Company as one of the largest emitters of carbon has an important role in reducing CO<sub>2</sub> emissions.

One way to reduce CO<sub>2</sub> emissions is create an efficient production system of carbon emissions. The system includes setting of human resources behavior, production technology, using of carbon-friendly energy and fuels, etc.. But until now researchers and

practitioners are still looking for the right concept for managing carbon emissions in production process. Therefore, the concept of carbon emissions management is still the discourse and can not yet be fully implemented in the production process.

In accounting terminology, concept of carbon emissions management is identical to the concept of carbon cost management which is convert and minimize the carbon emissions into monetary units. According to the explanation above, it can be proposed that the concept of carbon cost management is still the discourse and can not yet be fully implemented in the production process

Based on the explanation and developing the theoretical framework outlined above, then the hypotheses of this research are:

Hypothesis 1: Average score of carbon cost management practices in companies is lower than the average score of the concept of carbon cost management approved by the respondents.

Hypothesis 2: There are disparities between concept and implementation of the concept of carbon cost management.

Referring to the formulation of research problems, the first hypothesis used to answer the first and second research questions, whereas the second hypothesis used to answer the third research question. Figure 2 shows the relationship of CO<sub>2</sub> emissions and behavioral response in CO<sub>2</sub> reduction, while the figure 1 illustrates the conceptual framework of the current research.

### **III. RESEARCH METHODOLOGY**

#### **Sampel**

Sample in this study are the companies most vulnerable to environmental issues, particularly CO<sub>2</sub> emissions. Almost all manufacturing firms are vulnerable to problems caused by carbon dioxide gas from the production process. Therefore, the population of this study is all manufacturing firms in Central Java, Indonesia. While the sample determined by purposive random sampling.

The first criteria which used in purposive sampling is the companies which is registered as an active participant of the PROKASIH program issued by Environment Agency (Badan Lingkungan Hidup, BLH) in Central Java. Second, company registered as participants in PROPER Program issued by BLH of Central Java. The third criterion are the manufacturing companies of which are concentrated in Regions for Small Industries (Lingkungan Industri Kecil, LIK) Kaligawe Semarang. The total number is determined based on a purposive sample was 317 companies. From these 317 companies, randomly selected samples to determine the 200 selected samples.

From the 200 selected samples, 170 samples sent questionnaires via postal mail, and obtained 65 questionnaires returned, 57 with answers, and eight others back without answers to these questions in the questionnaire. 30 samples of remaining firms sent a questionnaire by direct mail. This is done to examine the practices of carbon cost management through direct interviews, and to measure non-response bias from the respondents. From the 30 remaining samples, 18 companies are willing to do interviews. Thus the total of samples is 75 respondents.



### **Variables and operational definitions of variables**

Variables in this study are the concepts of carbon cost management and the practices of carbon cost management. Carbon cost management concepts are concepts or ideas about the efficiently carbon emissions management in order to obtain low-cost emissions. Concepts are referenced from the research and focus group discussions which were conducted by Ratnatunga (2007b, 2010) in various countries, including Indonesia. There are 24 concepts (items) that summarized in Table 1, including cost management systems, production management, and Corporate Governance.

Variable of carbon cost management practices are the concepts about the carbon cost management that is practiced by companies in thier production systems / management accounting system. Reference used is the concept of carbon cost management in Table 1 that is practiced.

Each item in the 'concepts' variable measured by 6 scale, where number 1 represents 'strongly disagree' and the number 6 represents 'strongly agree'. While the variable of 'carbon cost management practices' were also measured with 6 scale, where the number 1 represent 'not very applicable (in practice) and number 6 represent very applicable (in practice). In brief, each item presented in Table 6.

## **IV. RESULTS AND DISCUSSIONS**

The description of Respondent can be seen in Table 2 (see Appendix). From the table it can be shown that 69.3% of the 75 respondents are male. 64% respondents were in finance and or accounting job position, and 76% of respondents are at managerial level, while 24% of respondents at the supervisor level. Based on the statistical description of

these respondents, it can be concluded that the research data have high validity because the data evaluated from the proper respondent in response to the field of research.

## **Hypothesis Test**

### ***Test for Hypothesis -1***

Hypothesis testing results are presented in Table 3, and Table 5 (see appendix). From Table 3 it can be seen that overall there is disparity between the concept and practices of carbon cost management (with p-value  $0.000 < 0.05$ ). It is mean that the concept of carbon emission reduction in order to restrain the rate of global warming is still limited discourse, and not yet fully implemented. In pairs 1 of Table 3 note that the mean difference between the concept and practice of carbon cost management shows the difference 29.547 and for each item for the concept and practices of carbon cost management (e.g. SCM1 with PSCM1) had a mean difference range 1.2 to 1.84.

The mean difference value indicates that the carbon cost management practices are still very low (between scale 1 (very not apply) to 3 (less applicable)). This means also that the implementation of carbon cost management practices are still very low compared with respondent's expectation. However, the carbon cost management paradigm at least has become a thematic discourse for firm. This result indicate that the hypothesis 1 cannot be rejected.

The result of direct interviews of some of the respondents indicates a serious concern of the managers of the company against the global warming issue. Some respondents claimed that the law setting efforts by the Government in terms of environmental management is still lacking to provide support for the implementation of environmental management, including carbon management, for companies. So far they felt

pressures without any effort to clear solution from government (See Jafar S., and Dista A 2006). Now it is clear that respondents highly appreciate the concept of the Carbon Cost Management, but they have not yet fully implement those concepts.

### ***Test for Hypothesis -2***

Items of the concept and practices of carbon cost management can be seen in Table 5. Except for the items (SCM17-PSCM18); (SCM18-PSCM18) and (SCM22-PSCM22), all statistical values indicate that the hypothesis-2 cannot be rejected (sign  $<0.05$ ). In connection with 17th item (Recovery), there is limited attention from management to products recovery cost, i.e. a decrease in prices of raw materials is not fully considered as the efficiency of carbon credits (See Table 6 in appendixes).

Of course, almost no difference in mean between their assessment of 17th concept and it practice, because there are no national regulations concerning the concept of carbon trading. Also, for 18th and 22nd items, i.e. the effectiveness of production-based economy and the environment, the law enforcement factors and compliance with the carbon emissions target. The absence of disparity between concepts and implementations of these items is because companies generally do not have the concept of strategy based on economic and ecological balancing. If there is environmental Management reporting process, it was only due to a demand and not because of the awareness. On the other hand, the government has not set explicitly about the threshold of carbon emissions for a specific company. Regulations that there is currently only about a general limitation on the amount of emissions allowed in the production process which place more emphasis on economic efficiency alone.

In the perspective of management control system (1st item), there are disparities discourse (concepts) with practice. Respondents agreed that modifications of the system to achieve efficiently-carbon target through arrangement of employee behavior is needed. In the dimension of culture, control systems must be able to create efficiently-carbon emissions culture. But in practice, the average respondent acknowledged that such systems have not practiced in their company. Interviews with several managers production shows that efficiency in production process are more stressed in terms of cost of production through the instrument of direct labor. In fact, the efficiency on the overhead is very important for suppressing the production of carbon emissions, for example with efficiently fuel and energy, and testing of raw material quality.

Lean production techniques (2nd item) are also still a discourse, so there is a significant disparity between concept and practice of Carbon Cost Management. Attention on minimization of production energy, use of raw materials and waste time reduction sufficiently must be done to attain the target of carbon emissions efficiently. But in practice, the implementation of this concept is still a constraint because of the scarcity of environmental friendly technologies.

Likewise for items of Total Quality Management (TQM) and Controlling Costs (5th and 7th items) are important items that are not noticed by the company. Energy efficiency (and thus the efficiency of carbon) is still viewed in purely economic perspective. So that in practice there is no action that emphasizes the aspects of the quality products and achieving the carbon emission targets. Lean accounting system should be able to practice carbon cost efficiency.



## **Factors Analysis of Carbon Cost Management**

In the next analysis, research was developed to classify the factors of carbon cost management in the two group strategies simpler. Results of factor analysis are shown in Table 4, which indicates that the 1st - 16<sup>th</sup> items, 23rd and 24th is one factor with high loading, and referred to as the first factor. The first factor is called Carbon Production Factors in Strategic Cost Management, because it is generally associated with the philosophy, concepts and production techniques. While the rest concepts (17th to 22th items) are considered as a Controlling Factor of Carbon Cost Management, because the concepts are emphasized on the aspect of managerial and strategic planning. The complete results can be seen in Table 4, which is conceptually based on Table 6.

### **Production and Controlling Factors**

As explained previously, the results of factor analysis showed that the carbon cost management concepts developed by Ratnatungga (2007b) have been grouped into two major categories, namely factors of production and factors controlling (controlling). In the subsequent analysis phase, the research analyze whether there is any disparity between the concept and the practice of carbon cost management from two dimensions.

The results show that there is disparity between the concept and the practice of carbon cost management views from production and controlling dimensions (Table 5). These results suggest that concepts of carbon cost management, which are generally associated with environmental management, not yet fully implemented both in terms of production or controlling.

The research was done by Jafar and Lisa (2009) showed that carbon accounting paradigm is influenced by three factors namely management control systems, production

management and good corporate governance practices. There are similarities conclusions between the researches above with current research, i.e. carbon accounting was still in the paradigm (concept) stage, and there are no serious forces that are encourage the implementatio of the concept of carbon cost accounting in business practices in Indonesia. Jafar S (2008) concluded that so far the government presence only as facilitator by providing incentives such as interest soft loans for companies that care about the environment (e.g. for a company that has Blue status on PROPER classification). Thus the role of government is not yet giving stimulants to efficient behavior of carbon emissions.

Viewed from the paired sample t-test (Table 5) it can be concluded that the t-value of practice-concept disparity in production factor is far above the t-value of concept-practice disparity in controlling factor ( $13.056 > 4.360$ ). This suggests that the factors of production are main factor in the disparity behavior. That is, when the practice of production system is deviate from system of efficient production of carbon emissions, then there would be no control over the efficient carbon emissions. Meanwhile, research Jafar (2008) showed that proactive environmental management (internal willingness company) is a key factor in the company to care about the environment. This means that an efficient production system based on carbon emissions would be formed if the company has the willingness to establish the system. Therefore, the lean accounting system, lean production systems, employee safety, management control systems and various other concepts in the production factors is the basic system of carbon low-emissions.

## **V. CONCLUSIONS, LIMITATIONS AND RESEARCH IMPLICATIONS**

The main conclusions of this study is that there is a disparity between concept and practice of carbon cost management. Concepts and expectations initiated by researchers,

professionals and practitioners cannot be implemented fully within the scope of the company. These concepts are classified into two factors, i.e. production factor and controlling factor. Factor of production is the most important factor to consider if the company wants to develop a strategic system of Carbon Cost Management.

This study has several limitations: first, the concept of Carbon Cost Management be studied only from the idea of Ratnatunga (2007b). Second, the field of research studies are also very specific. Therefore, subsequent research needs to be done by considering the following two things: first, a review of the subsequent research requires the development of carbon cost management concepts from the various sources of adequate literature. Second, the research that links between Carbon Cost Management variable with other variables, such as contingency factors, design system of Carbon Cost Management, and design of accounting information system based on efficiently carbon emissions.

Actually, research in the field of carbon cost management is still very rare. Likewise, the literature that discusses the concept of carbon cost management and carbon cost accounting is still very little. Therefore, the study area of carbon cost is still very wide, such as transaction of carbon (Callon, 2009), accounting standards for carbon emissions transactions (Cook, 2009, Ratnatunga, 2010), the role of carbon trading business network (Braun, 2009), carbon transaction accounting system (Lohmann, 2009), attention from the international community on environmental and social impacts of corporate activity (Yongvanich and James Guthrie, 2006) taxation system and tax incentives associated with carbon trading, and carbon trading regulations (Subramaniam, and J. Ratnatunga, 2003; Ratnatunga, 2007a; 2007b; 2008; 2010).

## References:

- Bose, Sudipta, (2006), Environmental accounting and Reporting in Fossil Fuel Sector: A Study on Bangladesh Oil, Gas and Mineral Corporation (Petrobangla), *The Cost and Management*, Vol. 34, No. 2, March-April, pp. 53-67
- Braun, Marcel, (2009), The evolution of emissions trading in the European Union – The role of policy networks, knowledge and policy entrepreneurs, *Accounting, Organizations and Society*, Elsevier, V. 34, pp. 456-468.
- Byod, James, and spencer Banzhaf, (2006), What Are Ecosystem Services? The Need for Standardized Environmental Accounting Units, <http://papers.ssrn.com>, Discussion Paper, Resouces for The Future.
- Callon, Michel, (2009), Civilizing markets: Carbon trading between *in viro* and *vivo* experiments, *Accounting, Organizations and Society*, Elsevier, V. 34, pp. 535-548.
- Cook, Allan, (2009), Emission rights: From costless activity to market operations, *Accounting, Organizations and Society*, Elsevier, V. 34, pp. 488-498.
- Driesen, David M., (2007), Sustainable Development and Market Liberalism's Shotgun Wedding: Emission Trading Under The Kyoto Protocol, <http://ssrn.com>
- Epstein J., Marc, and Martin Freedman (1994), Sosial Disclosure and the Individual Investor, *Accounting, Auditing & Accountability Journal*, Vol. 7, No. 4, pp. 94-109
- Hackston, D. and M. J. Milne. 1996. Some Determinants of Social and Environmental Disclosures in New Zealand Companies. **Accounting, Auditing, and Accountability Journal**, Vol. 9 No. 1.
- Ja'far S., Muhammad., (2008), Peran Kebijakan Pemerintah dalam Pengelolaan dan Pelaporan Kinerja Lingkungan oleh Perusahaan-perusahaan Publik di Indonesia, *Simposium Nasional Akuntansi, XI*, Pontianak.
- Ja'far S., Muhammad, dan Dian Tanila C. (2009), Identifikasi Praktik Pengungkapan Lingkungan serta Pengaruh Faktor Keuangan dan Non-Keuangan Perusahaan terhadap Luas Pengungkapan Lingkungan di Indonesia, *Procceding: Dampak Country Risk terhadap Perusahaan ditinjau dari Aspek Manajemen dan Akuntansi*, Universitas Kristen Duta Wacana, Yogyakarta.
- Ja'far S., Muhammad dan Dista Amalia A. 2006. Pengaruh Dorongan Manajemen Lingkungan, Manajemen Lingkungan Proaktif dan Kinerja Lingkungan Terhadap Public Environmental Reporting. *Proceeding: Simposium Nasional Akuntansi IX*, Padang.

Ja'far S., Muhammad, dan Lisa K., (2009a), Need Assesment: Standard Akuntansi Karbon dan Praktik Carbon Accounting, *Proceeding: Toward a New Indonesia Business Architercture*, The 3rd National Conference Faculty of Economics, Unika Widya Mandala, Surabaya.

\_\_\_\_\_, (2009b), Carbon Accounting: Implikasi Strategis Perencanaan Akuntansi Manajemen, . *Proceeding: Simposium Nasional Akuntansi XII*, Palembang.

Lohmann, Larry, (2009), Toward a different debate in environmental accounting: The cases of carbon and cost-benefit, *Accounting, Organizations and Society*, Elsevier, V. 34, h. 499-534.

Löschel, Andreas, and Zhong Xiang Zhang, (2002), The Economic and Environmental Implications of the US Repudiation of the Kyoto Protocol and the Subsequent Deals in Bonn and Marrakech, <http://ssrn.com>.

MacKenzie, Donald (2009), Making things the same: Gases, emission rights and the politics of carbon marktes, *Accounting, Organizations and Society*, Elsevier, 34, pp. 440-455.

McCright, Aaron M., and Riley E. Dunlap, (2008), Social Movement identity and Belief Systems: An Examination of Beliefs About Environmental Problems within the Amreican Public, *Public Opinion Quarterly*, Vol. 72, Issue 4, pp. 651-676

Ratnatunga, Janek, (2007a), An Inconvenient Truth about Accounting, *JAMAR*, Vol. 5 No. 1, pp. 1-20

\_\_\_\_\_, (2007b), Carbon Cost Accounting: The Impact of Global Warming on the Cost Accounting Profession, *JAMAR*, Vol. 5 No. 2, pp. 1-8

\_\_\_\_\_, (2008), Carbonomics: Strategic Management Accounting Issues, *JAMAR*, Vol. 6 No. 1, h.1-10

\_\_\_\_\_ (2010). The Carbonomics of an Upturn: Financial and Management Accounting Issues, *Seminar Paper*, 2nd Parahyangan International Accounting Business Conference.

\_\_\_\_\_, dan Muhamed Ariff (2005), Towards a holistic Model of Corporate Governance, *JAMAR*, Vol. 3, No. 1, pp. 1-15

Salomone, Roberta and Giulia Galluccio. 2004. Environmental Issues And Financial Reporting Trends: A Survey In The Chemical And Oil& Gas Industries. <http://ssrn.com>. Diakses tanggal 16 November 2006.

Subramaniam, Nava dan Janek Ratnatunga, (2003), Corporate Governance: Some Key Chalersgers and Opportunities for Accounting Research, *JAMAR*, Vol. 1, No. 2, pp. 1-8

United Nations, (1998), *Kyoto Protocol to The United Nations Framework Convention on Climate Change*, downloaded by <http://www.google.com>

Yongvanich, Kittiya, James Guthrie, (2006), An Extended Performance Reporting Framework for Social and Environmental Accounting, *Business strategy and the Environment*, wiley InterScience, 15, pp.309-321

## APPENDIX

Table 1. Issues in Strategic Carbon Cost Management Issues

SCM Issue	Carbon Management Impact
<i>Management Control Systems</i>	Employee behaviour modification to achieve carbon efficiency targets
<i>Production Management</i>	Lean production techniques. More attention to the use of energy in machinery, less materials and time wastage. JIT philosophy.
<i>Employee Safety</i>	Ensuring low energy work environment do not cause hazardous working conditions
<i>Wages &amp; Trade Union Demands</i>	May demand more if comfort levels fall. More demands for the sharing of high carbon windfall profits
<i>Total Quality Management</i>	Carbon efficiency seen as part of quality equation
<i>Purchasing Management</i>	Production resources (components, labour, and overhead) sourced locally.
<i>Cost Control</i>	Lean Accounting. Significant attention paid to reduce carbon emission costs. More use on Backflush Costing methods
<i>Make or Buy Decisions</i>	Consideration given to carbon emissions when considering alternatives
<i>Cost Classification</i>	Carbon costs classified into direct, indirect, fixed and variable costs.
<i>Allocating Indirect Costs</i>	Variation of ABC by having consideration of 'carbon cost drivers' to link emission indirect overhead to products and services
<i>Life Cycle Costing</i>	Amortisation of design costs to make products more carbon friendly and worker training costs to reduce carbon emissions
<i>Target Costing</i>	Redesigning products and services to meet carbon emission targets
<i>Benchmarking</i>	Comparing the KPIs of World Class performers in carbon efficiency
<i>Customer Profitability Analysis</i>	Segmenting customers by profitability per carbon usage
<i>Process Control and Activity Based Management</i>	Evaluating the performance of organisational processes, including white-collar departments in terms of achieving carbon efficiency KPIs.
<i>Efficiency or Productivity</i>	Consideration given not only to economic efficiency, but also carbon usage efficiency.
<i>Price Relationship or Recovery</i>	Reductions in purchase prices considered via the sale of carbon efficiency credits
<i>Overall Effectiveness</i>	This profitability of the bottom-line figure given in terms of both economic and environmental effectiveness.
<i>Value-Adding/Non-Value Adding Work</i>	All reworks, recoveries, errors etc. considered to be avoidable carbon emitting activities
<i>Executive Information Systems (EIS)</i>	The drill-down facilities to be extended to financial and non-financial carbon emitting measures.
<i>Corporate Governance</i>	Accountability and transparency issues extended reporting on carbon management initiatives
<i>Enforcement and Compliance</i>	Voluntary and mandatory enforcement of carbon emission targets
<i>The Strategic Audit</i>	Extended to cover the expected future carbon footprint of the organisation due to its production, marketing, logistics, capital investment and HRM practises
<i>Corporate Reputation Audit</i>	The evaluation of the organisation's image and brand with regards to being a responsible carbon citizen of the world.

Source: Ratnatunga, Janek. 2007b. Carbon Cost Accounting: The Impact of Global Warming on the Cost Accounting profession. *Journal of Applied Management Accounting Research*, 5(2), pp. 1-8.

Table 2. Descriptive Statistic

Keterangan	Mean/Median/Modus	Persentase (%)
Jenis Kelamin <ul style="list-style-type: none"> <li>Laki-laki</li> <li>Perempuan</li> </ul>	<ul style="list-style-type: none"> <li>√</li> </ul>	<ul style="list-style-type: none"> <li>69,3</li> <li>30,7</li> </ul>
Posisi <ul style="list-style-type: none"> <li>Keuangan &amp;/ Akuntansi</li> <li>Produksi</li> <li>Internal audit</li> <li>Lainnya</li> </ul>	<ul style="list-style-type: none"> <li>√</li> </ul>	<ul style="list-style-type: none"> <li>64</li> <li>18,7</li> <li>6,7</li> <li>10,7</li> </ul>
Jabatan <ul style="list-style-type: none"> <li>Manajer</li> <li>Supervisort</li> </ul>	<ul style="list-style-type: none"> <li>√</li> </ul>	<ul style="list-style-type: none"> <li>76</li> <li>24</li> </ul>
Pendidikan <ul style="list-style-type: none"> <li>S1</li> <li>S2</li> </ul>	<ul style="list-style-type: none"> <li>√</li> </ul>	<ul style="list-style-type: none"> <li>56</li> <li>44</li> </ul>
Lama Kerja	4 Tahun	

Table 3. Paired Samples Test: Mean Difference Test Between Concept and Practice

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Strategic Carbon cost management concept - Statelegic Carbon cost management pratice	29,547	18,931	2,186	25,191	33,902	13,516	74	,000
Pair 2	SCM1 - PSCM1	1,733	1,308	,151	1,432	2,034	11,474	74	,000
Pair 3	SCM2 - PSCM2	1,840	1,274	,147	1,547	2,133	12,509	74	,000
Pair 4	SCM3 - PSCM3	1,773	1,269	,147	1,481	2,065	12,103	74	,000
Pair 5	SCM4 - PSCM4	1,200	1,375	,159	,884	1,516	7,556	74	,000
Pair 6	SCM5 - PSCM5	1,320	1,810	,209	,904	1,736	6,317	74	,000
Pair 7	SCM6 - PSCM6	1,293	1,194	,138	1,019	1,568	9,379	74	,000
Pair 8	SCM7 - PSCM7	,867	1,266	,146	,575	1,158	5,927	74	,000
Pair 9	SCM8 - PSCM8	,947	1,272	,147	,654	1,239	6,444	74	,000
Pair 10	SCM9 - PSCM9	1,387	1,524	,178	1,036	1,737	7,882	74	,000
Pair 11	SCM10 - PSCM10	1,880	1,284	,148	1,585	2,175	12,684	74	,000
Pair 12	SCM11 - PSCM11	1,227	1,311	,151	,925	1,528	8,104	74	,000
Pair 13	SCM12 - PSCM12	1,493	1,891	,218	1,058	1,929	6,837	74	,000
Pair 14	SCM13 - PSCM13	1,307	1,102	,127	1,053	1,580	10,284	74	,000
Pair 15	SCM14 - PSCM14	1,093	1,499	,173	,748	1,438	6,315	74	,000
Pair 16	SCM15 - PSCM15	1,800	1,385	,160	1,481	2,119	11,253	74	,000
Pair 17	SCM16 - PSCM16	1,653	1,728	,200	1,256	2,051	8,286	74	,000
Pair 18	SCM17 - PSCM17	,333	2,042	,238	-,137	,803	1,413	74	,182
Pair 19	SCM18 - PSCM18	,200	2,325	,268	-,335	,735	,745	74	,459
Pair 20	SCM19 - PSCM19	1,493	2,429	,281	,934	2,052	5,323	74	,000
Pair 21	SCM20 - PSCM20	1,480	2,777	,321	,841	2,119	4,615	74	,000
Pair 22	SCM21 - PSCM21	,640	2,071	,239	,164	1,116	2,677	74	,009
Pair 23	SCM22 - PSCM22	,053	1,038	,120	-,186	,292	,445	74	,658
Pair 24	SCM23 - PSCM23	1,187	1,392	,161	,866	1,507	7,383	74	,000
Pair 25	SCM24 - PSCM24	1,347	1,564	,181	,987	1,706	7,457	74	,000



Tabel 4. Rotasion Matrix Factor Analysis by Using Varimax

**Rotated Component Matrix <sup>a</sup>**

	Component	
	1	2
SCM1	,874	,053
SCM2	,949	,081
SCM3	,934	,094
SCM4	,750	-,122
SCM5	,710	-,180
SCM6	,710	-,021
SCM7	,682	-,117
SCM8	,427	,121
SCM9	,794	,187
SCM10	,943	,051
SCM11	,774	-,115
SCM12	,401	,269
SCM13	,571	,035
SCM14	,727	,198
SCM15	,635	,189
SCM16	,724	-,050
SCM17	,044	,580
SCM18	-,121	,728
SCM19	,109	,671
SCM20	-,032	,869
SCM21	,133	,664
SCM22	-,020	,455
SCM23	,723	-,079
SCM24	,768	,222

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.  
 a. Rotation converged in 3 iterations.

**Component Transformation Matrix**

Component	1	2
1	,996	,084
2	-,084	,996

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.

Table 5. Paired Samples Test for Production and Controlling Factors

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Production Factors of SCCMConcept	81,93	75	15,736	1,817
	Production Factors of SCCMPractice	56,59	75	6,282	,725
Pair 2	Controlling Factors of SCCMConcept	27,69	75	5,485	,633
	Controlling Factors of SCCMPractice	23,49	75	5,869	,678

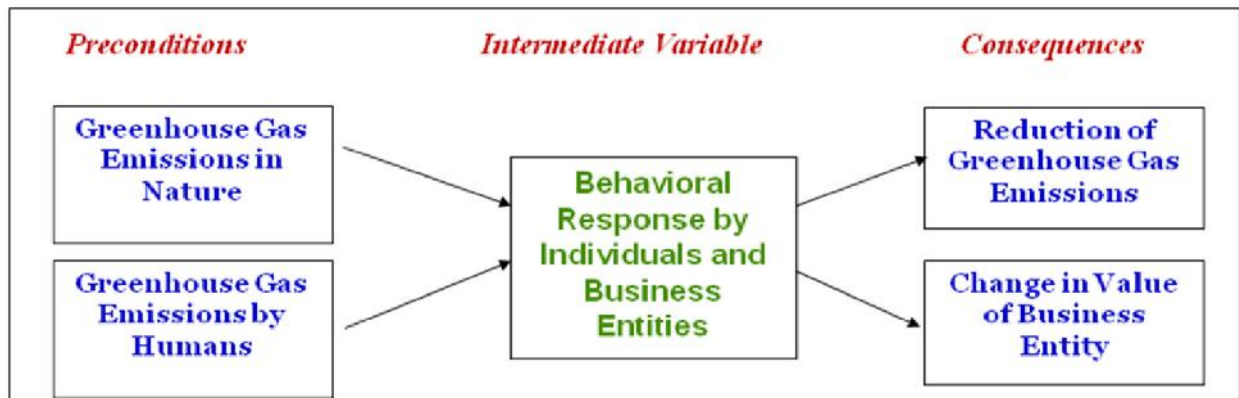
  

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Production Factors of SCCMConcept - Production Factors of SCCMPractice	25,347	16,813	1,941	21,478	29,215	13,056	74	,000
Pair 2	Controlling Factors of SCCMConcept - Controlling Factors of SCCMPractice	4,200	8,342	,963	2,281	6,119	4,360	74	,000

Table 6. Matching concepts and practices of Carbon Cost Management

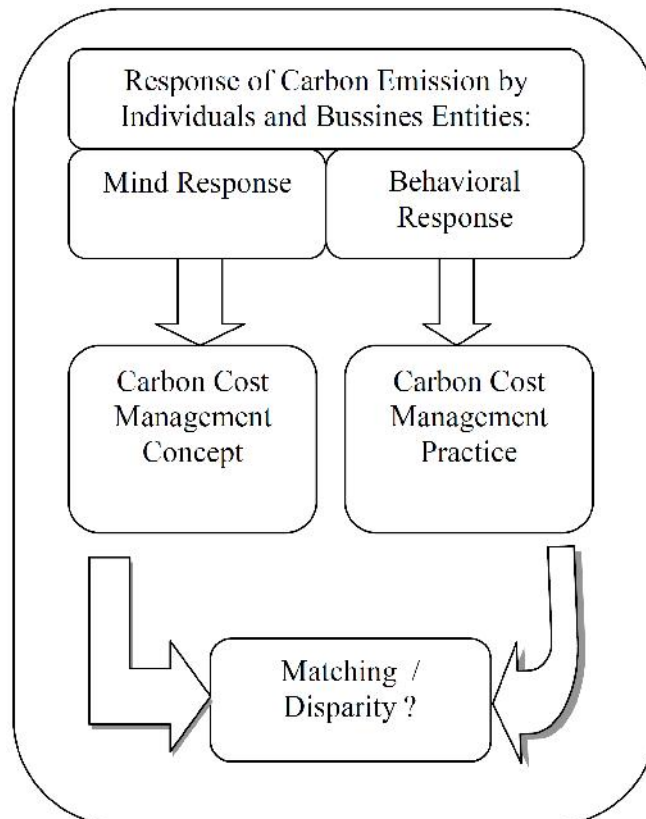
Concepts of CCM (Strategic CCM /SCM)	Items of Carbon Cost Management (CCM) initiated by Ratnatunga (Ratnatunga, 2007b)	Practices of CCM (Practice Strategic CCM / PSCM)
SCM1	Employee behaviour modification to achieve carbon efficiency targets	PSCM1
SCM2	Lean production techniques. More attention to the use of energy in machinery, less materials and time wastage. JIT philosophy.	PSCM2
SCM3	Ensuring low energy work environment do not cause hazardous working conditions	PSCM3
SCM4	May demand more if comfort levels fall. More demands for the sharing of high carbon windfall profits	PSCM4
SCM5	Carbon efficiency seen as part of quality equation	PSCM5
SCM6	Production resources (components, labour, and overhead) sourced locally.	PSCM6
SCM7	Lean Accounting. Significant attention paid to reduce carbon emission costs. More use on Backflush Costing methods	PSCM7
SCM8	Consideration given to carbon emissions when considering alternatives	PSCM8
SCM9	Carbon costs classified into direct, indirect, fixed and variable costs.	PSCM9
SCM910	Variation of ABC by having consideration of 'carbon cost drivers' to link emission indirect overhead to products and services	PSCM10
SCM11	Amortisation of design costs to make products more carbon friendly and worker training costs to reduce carbon emissions	PSCM11
SCM12	Redesigning products and services to meet carbon emission targets	PSCM12
SCM13	Comparing the KPIs of World Class performers in carbon efficiency	PSCM13
SCM14	Segmenting customers by profitability per carbon usage	PSCM14
SCM15	Evaluating the performance of organisational processes, including white-collar departments in terms of achieving carbon efficiency KPIs.	PSCM15
SCM16	Consideration given not only to economic efficiency, but also carbon usage efficiency.	PSCM16
SCM17	Reductions in purchase prices considered via the sale of carbon efficiency credits	PSCM17
SCM18	This profitability of the bottom-line figure given in terms of both economic and environmental effectiveness.	PSCM18
SCM19	All reworks, recoveries, errors etc. considered to be avoidable carbon emitting activities	PSCM19
SCM20	The drill-down facilities to be extended to financial and non-financial carbon emitting measures	PSCM20
SCM21	Accountability and transpa management initiatives	PSCM21
SCM22	Voluntary and mandatory enforcement of carbon emission targets	PSCM22
SCM23	Extended to cover the expected future carbon footprint of the organisation due to its production, marketing, logistics, capital investment and HRM practises	PSCM23
SCM24	The evaluation of the organisation's image and brand with regards to being a responsible carbon citizen of the world.	PSCM24

Figure 1. Carbon Emission and Behavioral Response in Reduction of GGE



Source: Ratnatungga, Janek. 2010. *The 2nd Parahiyangan International Accounting Business Conference*, Universitas Parahyangan, Bandung.

Figure 2. Conceptual Framework



**Questionnaire:** Original questionnaire by using the Indonesian language

**Kuesioner Penelitian Konsep Strategic Carbon Cost Management.**

Efek pemanasan Global telah mengakibatkan isu manajemen biaya karbon sebagai konsep strategis perusahaan untuk dapat bertahan di masa mendatang. Berikut ini adalah beberapa konsep strategis yang terkait dengan Manajemen Biaya Karbon yang penting bagi perusahaan. Bapak/Ibu diminta menyilang salah satu angka dimulai dari angka 1, mewakili sangat tidak setuju, sampai dengan angka 6, mewakili sangat setuju, sebagai indikator kesetujuan Bapak/Ibu terhadap konsep-konsep berikut ini:

---

1	6
Sangat tidak setuju	Sangat Setuju

1. Adanya modifikasi perilaku karyawan untuk mencapai target efisiensi karbon
2. Adanya teknik produksi ramping, yaitu lebih memperhatikan penggunaan energi dalam mesin, bahan baku secukupnya dan waktu produksi secukupnya, misalnya menggunakan filosofi JIT dalam produksi.
3. Adanya kepastian bahwa dalam lingkungan kerja dengan energi yang minim tidak menimbulkan kondisi kerja yang berbahaya
4. Adanya jaminan yang lebih baik jika tingkat kesejahteraan karyawan menurun, serta adanya permintaan sharing keuntungan yang lebih terhadap profit dari pengendalian biaya karbon.
5. Efisiensi Karbon dilihat sebagai bagian dari kualitas produk dan proses produksi.
6. Sumber daya produksi (bahan baku, tenaga kerja, dan overhead) berasal dari sumber lokal.
7. Adanya sistem Akuntansi yang ramping, yaitu perhatian yang serius untuk mengurangi biaya emisi karbon secara signifikan. Lebih menggunakan metode jejak rekam untuk mencatat biaya secara teliti.
8. Adanya pertimbangan yang menitik beratkan terhadap faktor emisi karbon, ketika ada alternatif-alternatif lain.
9. Biaya Karbon diklasifikasikan ke dalam biaya langsung, tidak langsung, biaya tetap dan biaya variable.
10. Adanya variasi konsep Activity Based Costing dengan memiliki pertimbangan 'driver biaya karbon' yang terkait dengan overhead emisi tidak langsung untuk produk dan jasa
11. Adanya Amortisasi atas biaya desain produk yang lebih ramah karbon dan biaya pelatihan pegawai untuk produksi berbasis rendah emisi karbon
12. Adanya Desain ulang produk dan jasa untuk mencapai target emisi karbon yang dikehendaki.
13. Adanya perbandingan dengan perusahaan papan atas (performers) dalam hal efisiensi emisi karbon.
14. Adanya segmentasi pelanggan dalam hal profitabilitas per karbon yang diemisikan
15. Adanya evaluasi kinerja proses organisasi, termasuk departemen whitecollar dalam mencapai standard efisiensi karbon.
16. Adanya pertimbangan produksi yang diberikan tidak hanya untuk efisiensi ekonomi, tetapi juga efisiensi penggunaan karbon

17. Penurunan harga pembelian dianggap sebagai kredit efisiensi karbon.
18. Profitabilitas produksi bagian bottom-line ditujukan untuk efektivitas ekonomi dan lingkungan
19. Pengolahan kembali, pemulihan, dan kesalahan lain dianggap sebagai minimalisasi emisi karbon.
20. Fasilitas drill-down dikembangkan untuk mengukur emisi karbon baik secara finansial ataupun non finansial.
21. Adanya akuntabilitas dan transparansi pelaporan manajemen karbon
22. Adanya voluntary dan mandatory penegakan target emisi karbon
23. Adanya pengembangan konsep untuk mencapai target emisi Carbon yang diharapkan di masa datang karena aktivitas produksi, pemasaran dan investasi modal serta sumberdaya manusia
24. Adanya evaluasi terhadap image dan merk perusahaan untuk membangun citra dengan menjadi bagian warga dunia yang bertanggung jawab terhadap emisi karbon.

### **Kuesioner Penelitian Praktik Strategic Carbon Cost Management.**

Atas pernyataan-pernyataan di bawah ini, Bapak/Ibu diminta memberi jawaban sesuai dengan kondisi yang berlaku di perusahaan tempat Bapak/Ibu bekerja. Jawaban atas pernyataan dilakukan dengan cara menyilang salah satu dari angka 1 sampai dengan angka 6. Angka 1 menunjukkan sangat tidak berlaku dan angka 6 menunjukkan sangat berlaku.

---

1		6
Sangat tidak berlaku		Sangat Berlaku

Di perusahaan tempat kami bekerja:

1. Modifikasi perilaku karyawan untuk mencapai target efisiensi karbon
2. Teknik produksi raming, yaitu lebih memperhatikan penggunaan energi dalam mesin, bahan baku secukupnya dan waktu produksi secukupnya, misalnya menggunakan filosofi JIT dalam produksi.
3. Adanya kepastian bahwa dalam lingkungan kerja dengan energi yang minim tidak menimbulkan kondisi kerja yang berbahaya
4. Adanya jaminan yang lebih baik jika tingkat kesejahteraan karyawan menurun, serta adanya permintaan sharing keuntungan yang lebih terhadap profit dari pengendalian biaya karbon.
5. Efisiensi Karbon dilihat sebagai bagian dari kualitas produk dan proses produksi.
6. Sumber daya produksi (bahan baku, tenaga kerja, dan overhead) berasal dari sumber lokal.
7. Adanya sistem Akuntansi yang ramping, yaitu perhatian yang serius untuk mengurangi biaya emisi karbon secara signifikan. Lebih menggunakan metode jejak rekam untuk mencatat biaya secara teliti.
8. Adanya pertimbangan yang menitik beratkan terhadap faktor emisi karbon, ketika ada alternatif-alternatif lain.

9. Biaya Karbon diklasifikasikan ke dalam biaya langsung, tidak langsung, biaya tetap dan biaya variable.
10. Adanya variasi konsep Activity Based Costing dengan memiliki pertimbangan 'driver biaya karbon' yang terkait dengan overhead emisi tidak langsung untuk produk dan jasa
11. Adanya Amortisasi atas biaya desain produk yang lebih ramah karbon dan biaya pelatihan pegawai untuk produksi berbasis rendah emisi karbon
12. Adanya Desain ulang produk dan jasa untuk mencapai target emisi karbon yang dikehendaki.
13. Adanya perbandingan dengan perusahaan papan atas (performers) dalam hal efisiensi emisi karbon.
14. Adanya segmentasi pelanggan dalam hal profitabilitas per karbon yang diemiskan
15. Adanya evaluasi kinerja proses organisasi, termasuk departemen whitecollar dalam mencapai standard efisiensi karbon.
16. Adanya pertimbangan produksi yang diberikan tidak hanya untuk efisiensi ekonomi, tetapi juga efisiensi penggunaan karbon
17. Penurunan harga pembelian dianggap sebagai kredit efisiensi karbon.
18. Profitabilitas produksi bagian bottom-line ditujukan untuk efektivitas ekonomi dan lingkungan
19. Pengolahan kembali, pemulihan, dan kesalahan lain dianggap sebagai minimalisasi emisi karbon.
20. Fasilitas drill-down dikembangkan untuk mengukur emisi karbon baik secara finansial ataupun non finansial.
21. Adanya akuntabilitas dan transparansi pelaporan manajemen karbon
22. Adanya voluntary dan mandatory penegakan target emisi karbon
23. Adanya pengembangan konsep untuk mencapai target emisi Carbon yang diharapkan di masa datang karena aktivitas produksi, pemasaran dan investasi modal serta sumberdaya manusia
24. Adanya evaluasi terhadap image dan merk perusahaan untuk membangun citra dengan menjadi bagian warga dunia yang bertanggung jawab terhadap emisi karbon.