

PROPOSE THE CARBON CREDIT MANAGEMENT PLATFORM TO IMPROVE CARBON CREDIT SUPPLY CHAIN MANAGEMENT

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Abstract:

Based on Paris Agreement to reduce carbon credits and plan to reduce greenhouse gas emissions to net zero by 2065, Thailand has developed plan. The national strategy that set up in the 12th National Economic and Social Development Plan has set the carbon dioxide emissions value in Strategy 4 (Green Growth). Goal 4 is Increase the efficiency of greenhouse gas reduction and adaptability to climate change. Carbon credit is one of favorite subject and require effective management in carbon credit supply chain. This research developed the Carbon Credit Management platform that can be improve carbon credit supply chain management. Management Information System (MIS) used to collect data about carbon credit information along with carbon credit history. By applying Geographic Information System (GIS) to display the information on a map for the modern and clarity of the information location. Including new opportunities of carbon credit business in which currently has not developed platform of this business yet.

Keywords: Carbon Credit, Supply Chain, the Carbon Credit Management platform, Geographic Information System.

1. Introduction

Today's global warming creates a rapidly changing climate, causing global temperatures to rise rapidly and polar ice caps melt faster than scientists have predicted for years. It is a factor affecting sea level rise and causing inclement weather throughout the world, such as The El Nino phenomenon or the La Nina phenomenon which caused the flood, storms and disasters in volumes that are increasing faster than expected and increasing severity. One of the main reasons is the emissions of various industrial sectors. In each country the volume is increasing steadily. Throughout the past 100 years that the world entered the industrial age. The carbon dioxide released into the atmosphere gathers in the Earth's atmosphere, creating a greenhouse effect which makes the Earth's atmosphere slimmer. As a result, the sunlight that passes through the earth has increased strength and heat as well. (National Geographic, 2019)

The greenhouse effect is an importance issue for all countries then an international agreement known as the Paris Agreement is created. An agreement under the United Nations Framework Convention on Climate Change. In order to reduce carbon emissions from 2020 onwards. Thailand is a member of the Paris Agreement which jointed agreement on 12 December 2015. The goal is to reduce the world's greenhouse gases by controlling the global temperature does not over 2 degrees Celsius (currently 2020 the target has been moved down to 1.5 degrees

Celsius). In the agreement, Thailand target is to reduce greenhouse gas about 7-20 percent in 2020 and lower than normal levels about 20-25 percent in 2030. (United Nation Climate Change, 2015)

Regarding to the Paris Agreement, Thailand prepares to reduce carbon dioxide. In order to achieve the goals and to increase trade competition. Including, an increasing trade barrier, referring to the value of carbon dioxide in international trade negotiations for a variety of products. According to the World Sustainable Development Agenda in 2030, consequently, the 12th National Economic and Social Development Plan has set the carbon dioxide emissions value in Strategy 4 (Green Growth). Goal 4 is Increase the efficiency of greenhouse gas reduction and adaptability to climate change. To prepare for the implementation of the strategy, which was set up according to the time frame. By starting to collect carbon dioxide emissions data in Thailand since 2016. (Office of the National Economic and Social Development Council, 2017)

From the target to reduce the rate of carbon dioxide emissions because carbon dioxide gas is not tangible. Consequently, tools must be used to measure the carbon footprint, which is the value used to measure the rate of carbon dioxide emissions that are greater or less from the birth of things to the end life (Youmatter, 2020). There is a global standard configuration. It's called the carbon credit, this is the reference value for reducing the amount of greenhouse gas of various agencies. The values that are much or less vary by product, business or country. As a result, there is a need to buy and sell carbon credit. Thus, the carbon market has been created for the business's benefit in terms of both product and competition. Recently, there are many countries have more conditions regarding carbon footprint. Causing various agency projects in reducing the carbon credit bill in many forms to meet the needs of the carbon market. However, there is not enough to meet the demands that are constantly increasing. (Youmatter, 2020)

The most important thing is carbon credit. It is a tradable commodity and can be used to offset the buyer's greenhouse gas emissions. The carbon market is divided into compulsory and voluntary carbon markets. Thus creating a new channel for conducting business in carbon credit which at present there is a department that regulates this business, a government agency arising under the Royal Decree establishing the Greenhouse Gas Management Organization (Public Organization) BE 2550 has the duty to supervise, control, and educate various departments. But the past is not widely known, the limited budget makes various public relations not generally accessible to the agency. (Greenhouse Gas Management Organization, 2020; Heuer, Kerdpitak & Kerdpitak, 2021; Thongrawd & Kerdpitak (2020).

Currently, the company has started to become aware and interested in reducing the carbon footprint. But most of them are just a few large companies in Thailand such as companies doing business in oil, electricity, cement, etc. This is done through projects that have the form of reducing the carbon footprint of the agency's production process. Affect the value of carbon credit in company has reducing.

Each company has reduced the value of carbon credit but not known other company in supply chain. The value of carbon credit in company have a private information. It is not share

information in supply chain. Some business such as Cement, Oil or Car have long supply chain product. Every company have the value of carbon credit not equal and not know the value of carbon credit in all supply chain (upstream – midstream – downstream). The result is carbon credit management in supply chain not efficiency.

There is no platform for management carbon credits between companies in supply chain. The Management Carbon credit in supply chain can be used as a guideline for management carbon credit, which is not limited to big companies. By distributing knowledge to various business sectors all that it takes is knowledge of carbon credit that can be put into operation as a useful new business in many ways.

Carbon credit management platform used to help company in supply chain to know the value of carbon credit in each company and management carbon credit. Company can make decisions to selected company to join business, which company have lower carbon credit. Result the carbon credit in supply chain has reduce too and increase competition in business.

Furthermore, to increase the use of the carbon credit management system, it must begin with carbon credit consumers, clarity and standards of qualifications and procedures must be established for entering this business. There is an agency that provides the right knowledge and advice in order to expand the carbon credit market. This will result in an increase in carbon credit market. Therefore, there should be a system for manage carbon credit to support the operation to be convenient and efficient for management. That will result in carbon credit as a product that will have a higher market value according to the principle of demand-supply. Including the market is still a new market that does not have many players. Therefore, it is a business channel that still has a long business opportunity.

Considering the benefits that will be gained from the development of the carbon credit management system. It was found that financial factors were important factors in motivating to join the business. Based on the short-term goal of reducing the carbon footprint by 7-20 percent in accordance with Paris Agreement in 2020. Until now, all countries have not been able to come close to that target. In addition, in the next 50 years, there is a new goal to be a world without carbon footprint (Race to Zero) (United Nation Climate Change, 2020), which is going to do. So, to achieve that goal, there must be a more intense and serious measure. The initial calculation of the carbon credit market value by considering the carbon dioxide emissions in Thailand in 2019, which emitted about 250 million tons of carbon dioxide, carbon dioxide and the market reference price of carbon credits was 600 baht per ton. It can be seen that the initial value is 150,000 million baht / year approximately according to the target set (The Greenhouse Gas Management Organization, 2019). Presently, the above mention of carbon credit, it is a number collected from some measurable activities, but it is not show other carbon credits that have not been studied yet.

However, carbon credit is not only domestic market. But it can also be expanded into a global market. That is globally demanded, especially in countries with a large demand for carbon credits such as China, America, India, etc. Whereas the country that emit much carbon footprint. It can be assumed that the market is large, and the value is unlimited. On the financial

side, it could be another opportunity for Thailand to earn more income from trading carbon credits. Since Thailand has become a seller country of carbon credit because Thailand is agricultural country and not a major industrial country.

The government realizes the importance of carbon credit and aims to achieve the targets agreed upon in the Paris Agreement. Furthermore, adding tax deductible benefits to companies which can reduce their carbon footprint. By providing additional tax deduction benefits to different companies that can reduce the carbon footprint. The company can be used as a tax deduction under the Royal Decree on Tax Exemption (No. 514) since 2011. Involved in reducing the carbon credit. As an incentive for companies to more and more participating in the carbon credit market. This is the benefit of reducing the company's carbon credit. The essence of which is the exemption of income tax on the Company's net profit, especially for different projects involved in reducing the carbon credit. As an incentive for companies to join the carbon credit market and it is the benefit of reducing the company's carbon credit (The Revenue Department, 2011).

On the other hand, indirect benefits that gain from the trading of carbon credit is cost reductions from where the company can reduce carbon credit. There are many reduction's models in carbon credits that represent a company's responsibility for its carbon footprint. This is in accordance with the agreement that has been made. The company can be used to publicize agencies and reduce the gap in international trade barriers for certain products. The reduction of carbon footprint has to be done through projects that affect the carbon credit, such as a tree-planting scheme that can be sold for carbon credit. There is an increasing demand for carbon credit then there is a need for more tree replacement projects as well. Resulting in a positive effect on the environment as well as. Therefore, this is an indirect benefit that can be gained from carbon credit trading.

Recently, in Thailand, there are limitations in terms of both knowledge and understanding on carbon credit management in supply chain. Moreover, the companies have not considered the importance of managing and reducing carbon credits. Therefore, it is necessary to set up a management system for managing the supply chain more conveniently and quickly as well as it can benefit the business of various agencies. The system must be effective in response to the needs of management and an incentive to enter the carbon credit business.

2. Research Objectives

1) To study the factors of carbon credit management in supply chain, 2) To develop the Carbon Credit Management platform, 3) Propose the Carbon Credit Management platform to improve carbon credit supply chain management.

3. Literature Review

3.1 Carbon credit definition

A carbon credit is a permit that allows the company that holds it to emit a certain amount of carbon dioxide or other greenhouse gases. One credit permits the emission of a mass equal to one ton of carbon dioxide. The carbon credit is one half of a so-called "cap-and-trade" program. Companies that pollute are awarded credits that allow them to continue to pollute up to a certain limit. That limit is reduced periodically. Meanwhile, the company may sell any unneeded credits to another company that needs them. Private companies are thus doubly incentivized to reduce greenhouse emissions. First, they will be fined if they exceed the cap. Second, they can make money by saving and reselling some of their emissions allowances. (Kenton, 2020).

A carbon credit represents the right to emit a measured amount of GHG. Carbon credits work as a certification that business or individual owning them is counterbalancing the emission of greenhouse gases (GHG). In this way, the system of carbon credits works as a compensation method assuring a balance between GHG emissions and the respective amounts of certified mitigations. The ultimate purpose of carbon credits is, therefore, to reduce the emission of GHG into the atmosphere. In other words, carbon credits are exchanged in a carbon market, commonly referred to as the cap-and-trade market, where businesses can sell each other's rights to pollute. (YouMatter, 2020)

3.2 Supply Chain theory

3.2.1 Supply Chain Definitions

A supply chain is a network between a company and its suppliers to produce and distribute a specific product to the final buyer. This network includes different activities, people, entities, information, and resources. The supply chain also represents the steps it takes to get the product or service from its original state to the customer. Companies develop supply chains so they can reduce their costs and remain competitive in the business landscape. Supply chain management is a crucial process because an optimized supply chain results in lower costs and a faster production cycle. (Kenton, 2020).

3.2.2 Supply Chain Management Definitions

Supply chain management (SCM) is the optimization of a product's creation and flow from raw material sourcing to production, logistics and delivery to the final customer. SCM encompasses the integrated planning and execution of processes required to manage the movement of materials, information and financial capital in activities that broadly include demand planning, sourcing, production, inventory management and storage, transportation -- or logistics -- and returning excess or defective products. Supply chain management relies on both business strategy, specialized software and collaboration to work.

Because it's such an expansive, complex undertaking, each partner -- from suppliers to manufacturers and beyond -- must communicate and work together to create efficiencies, manage risk and adapt quickly to change. In addition, supply chain sustainability -- which covers environmental, social and legal issues, in addition to sustainable procurement -- and the

closely related concept of corporate social responsibility -- which evaluates a company's effect on the environment and social well-being -- are areas of major concern for today's companies.

3.2.3 Basic factor in Supply Chain Management.

There is a basic pattern to the practice of supply chain management. Each supply chain has its own unique set of market demands and operating challenges and yet the issues remain essentially the same in every case. Companies in any supply chain must make decisions individually and collectively regarding their actions in five areas:

1. Production, what products does the market want? How much of which products should be produced and by when? This activity includes the creation of master production schedules that take into account plant capacities, workload balancing, quality control, and equipment maintenance.
2. Inventory, what inventory should be stocked at each stage in a supply chain? How much inventory should be held as raw materials, semifinished, or finished goods? The primary purpose of inventory is to act as a buffer against uncertainty in the supply chain. However, holding inventory can be expensive, so what are the optimal inventory levels and reorder points?
3. Location, where should facilities for production and inventory storage be located? Where are the most cost-efficient locations for production and for storage of inventory? Should existing facilities be used or new ones built? Once these decisions are made, they determine the possible paths available for product to flow through for delivery to the final consumer.
4. Transportation, how should inventory be moved from one supply chain location to another? Air freight and truck delivery are generally fast and reliable, but they are expensive. Shipping by sea or rail is much less expensive but usually involves longer transit times and more uncertainty. This uncertainty must be compensated for by stocking higher levels of inventory. When is it better to use which mode of transportation?
5. Information, how much data should be collected and how much information should be shared? Timely and accurate information holds the promise of better coordination and better decision making. With good information, people can make effective decisions about what to produce and how much, about where to locate inventory and how best to transport it.

3.3 Business Platform theory

3.3.1 Digital platform (Watanyoo Suksa-Ngiam, 2020)

The first means the infrastructure or a collection of products, services, tools and digital information to be used to create new products or services in a business is called vertical integration. This type of integration is upstream to downstream integration such as tablet computers. We can take the CPU and memory to assemble and build a portable computer with both the CPU and the memory, a product in itself by being rebuilt into a portable computer. In terms of horizontal integration, it means that the product or service can be adapted to new

markets, such as the transition from a laptop to a mobile phone. In the digital world, digital platforms will be used for both integration. Even if the platform can be transformed into new products and services. Or easily adapt to new markets than competitors will have a competitive advantage.

Second meaning refers to the things that help create a network effect means that the more people use digital platforms. Will result in lower costs per user and the benefits to users increase. For example if the number of Facebook users increases, the cost per user will decrease. And users will be more likely to use Facebook because they can communicate with many other users. Like a phone if a person can talk to others more, the benefits of users will increase accordingly. Academically this is called direct network effects. In addition, some digital platforms also cause indirect network effects. For example, if the number of Facebook users increases, marketers and marketers Ads will come to Facebook more as they help reach more customers.

Third meaning refers to things that can create multi-sided markets, multiple digital platforms, create multiple markets such as Amazon, and create a market for buyers. Means selling products directly to consumers and also create a market for people who want to sell products. For example when we want to be a seller on Amazon, we have to pay a fee to Amazon. Another example is the Apple iPhone. Apple sells mobile phones to consumers as the first market, and Apple has a second market, Applications market in the App Store. Use can choose to install applications in their own mobile. Apple has a share of the sales of applications, so many markets tend to correlate with network impact. And many of these markets will create the so-called digital ecosystem, where digital platforms are the infrastructure of digital ecosystems.

Digital platforms are therefore creating a monopoly. Because of the impact of multiple networks and markets, superior companies dominate almost all industries. The US E-Commerce industry is dominated by Amazon, or Facebook-dominated social media, so governments in many countries, especially the European Union, are trying to adopt antitrust measures to regulate these digital platforms. Not to monopolize trade in addition, some countries offer digital tax to block monopolies and expand digital platforms.

Digital platforms are something Thai businesses still lack. In the modern business world, it is not focused on creating products and services. Instead, it will focus on building a digital platform. Digital platforms without borders in other words, digital platforms built in the United States can be delivered to Thailand and other countries around the world. If Thai businesses have to compete globally changing the concept of doing business is important. Otherwise, Thai businesses may be destroyed. (Disrupt) finally go like the Thai media industry that at one time used to make enormous profits and had both political and economic influence. But now it has been destroyed by Facebook, Netflix, YouTube and Spotify, so digital platforms are a different form of commerce in the modern world from the imports and exports we are used to.

Digital platforms are online businesses that facilitate commercial interactions between at least two different groups with one typically being suppliers and the other consumers. Airbnb, Amazon, BlaBlaCar, Deliveroo, Facebook, Google, TaskRabbit, Uber, and Xing are all

platforms, but they have different business models and they interact with end users and other businesses in different ways. Consequently, each platform has created different rules to optimize these interactions. Some important distinctions are the degree to which a platform relies on advertising revenue versus fees, its rules for managing suppliers and content, and its relationship with consumers. (Information Technology & Innovation Foundation, 2018).

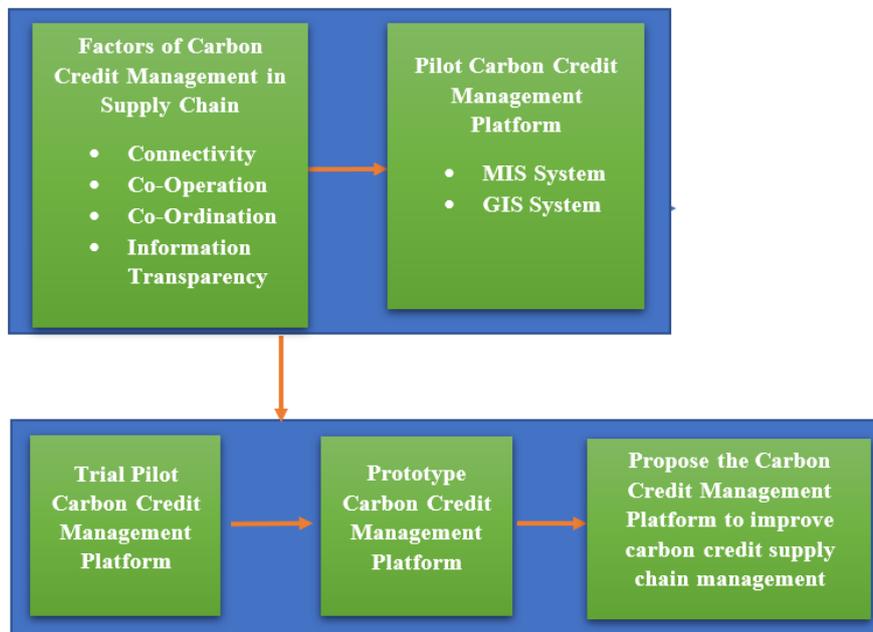
3.4 Geographic Information System (GIS)

GIS is an information system designed to collect, store, analyze information of the area. Both the location and description of the characteristics of the area, as well as search and display information. Therefore, GIS is not just a map or a picture. Rather, it is a database which collects information related to the area.

A database in a geographic information system consists of two databases:

1. Spatial database or a visual database (Spatial or Graphic Database) is a database of positional characteristics or symbols of objects, areas or phenomena of nature that appear on the earth's area. Spatial databases have two types of data structures:
 - Raster data structure is represented as a uniform grid. It is usually a square grid. First time saying each grid, which references a position in rows and columns, contains a number representing the type or data value that identifies the property of interest.
 - Vector data structures use to store positional coordinates (x, y) instead of the map feature (map feature), such as point, line and area. They are mostly used for intermittent spatial information such as streams, roads, etc.
2. Attribute Database
 - A relational database is a database that describes the nature or properties of geospatial data, storing both qualitative and numerical relevant data in a variety of database management systems such as dBase, Oracle, Sybase, and Microsoft Access. This database management system manages and processes data that characterizes spatial data. Linking spatial data with relational data is done using Common Key Code.

4 Conceptual Framework



All related documents and thesis are reviewed. The supply-chain, price and agency have important element of carbon credit. Then related documents and thesis are reviewed again about the factor of supply chain management. The fundamental key importance factor of carbon credit management in supply chain is connectivity, co-operation, co-ordination and information transparency. After that developed pilot carbon credit management platform for manage carbon credit supply chain. Adopted an online platform as a tool for manage carbon credit. Management Information System (MIS) used to collect data about carbon credit information along with carbon credit history. By applying Geographic Information System (GIS) to display the information on a map for the modern and clarity of the information location. After that, pilot carbon credit management platform is trial by sample and debug platform from any comment and suggestion. Finally, the Prototype Carbon Credit Management platform have developed and propose platform to improve carbon credit supply chain management. A conceptual framework for this research showing as follows.

5 Research Methodology

Research and Development (R&D) is method to be developed a business platform for carbon credit management in supply chain to use as a platform. This research divided into 2 phases: Phase 1 study factor of carbon credit management in supply chain and develop pilot carbon credit management platform, Phase 2 trial, debug and propose the Carbon Credit Management platform.

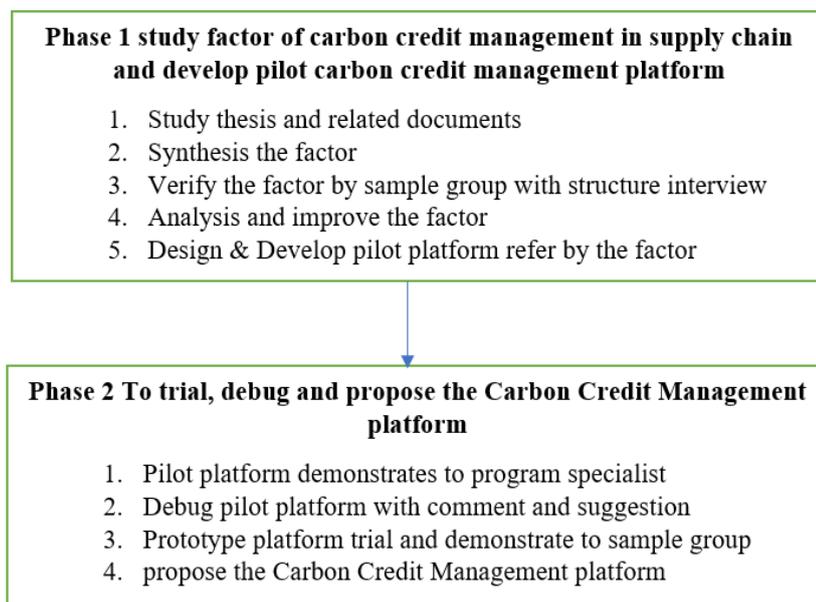
5.1 Research Sample

The samples group in this research is selected by specific selection, there are 15 people divided into 3 groups as follows. (5 carbon credit specialists, 5 policymaker's carbon credit in Thailand, 5 business-related persons)

5.2 Research Instruments

1. The structure interview form about the factor of carbon credit management in supply chain by dividing the content of the interview into 2 parts as follows
 - Part 1: General information of the company including name of company, type of agency.
 - Part 2: The factor of carbon credit management in supply chain
2. Delphi 10.3.2 is development program.
3. MySQL Server is an online database.
4. Google Map API to display maps as geographic information system (GIS).

5.3 Flowchart Methodology



6. Results of the study

Phase 1 study factor of carbon credit management in supply chain and develop pilot carbon credit management platform.

All relation documents and thesis are studied about factor of carbon credit management in supply chain. Based on data from the Greenhouse Gas Management Organization (Public

Organization). Various information from the documents are summarize. The factor of carbon credit management in supply chain are analyzed and defined into fundamental factors as follows.

Connectivity refers to all unit in carbon credit supply chain (Seller, Buyer and Regulator) can communicate and show information together.

Co-Operation refers to all unit in carbon credit supply chain (Seller, Buyer and Regulator) can join and share information to make business together.

Co-Ordination refers to inside each organization can use and exchange information between each division.

Information Transparency refers to real value of carbon credit from each organization and approve information by regulator.

Collected data from sample group about 15 persons. (5 policymaker's carbon credit, 5 carbon credit specialists, 5 business-related persons.)

Policy makers, Most of them agree with the fundamental factors that affecting carbon credit management in supply chain. Main focus on factors affecting communication between organization such as connectivity, co-operation and coordination. Information Transparency does not concern because the regulator can control and approve information by policy from government. By giving importance to the following order Connectivity -> Co-Operation -> Co-Ordination -> Information Transparency.

Carbon credit specialists, Most of them agree with the fundamental factors that affecting carbon credit management in supply chain. Main focus on factors affecting in management and supply chain such as Seller, Buyer and Regulator. Connectivity and Co-Operation have most effective from supply chain. Information Transparency is more effective because responsibility by regulator to verify and approve information from every organization. Co-Ordination is less effective because inside organization cannot control process, operation and various procedure in each organization. By giving importance to the following order Connectivity -> Co-Operation -> Information Transparency -> Co-Ordination.

Business-related, all of them totally agree with the fundamental factors that affecting carbon credit management in supply chain, with Connectivity and Information Transparency factors being the most important factors affecting the platform, Co-Operation, Co-Ordination there are still unclear differences in management. By giving importance to the following order Connectivity -> Information Transparency -> Co-Operation -> Co-Ordination.

Summarize and Sorting of the fundamental factors is Connectivity -> Information Transparency -> Co-Operation -> Co-Ordination.

Recommendations on factors that should be more studied, for example, Policy makers will add additional policy or legal that currently are not clear from the government. But there should be preparation to support this as well, carbon credit specialists will add to the value of carbon credit factor. In order to make carbon credit more attractive from all sectors and reducing

carbon credit in the future, business-related will increase the security of the information data due to the competitive effect of the business.

There is a consensus that should be a central platform to coordinate carbon credit management in supply chain. By designing the platform to be suitable and easy to use not complicated due to different groups of people because there are different platform skills. Summarize all comment and suggestion to develop pilot carbon credit management platform.

Phase 2 Phase 2 Trial, debug and propose the Carbon Credit Management platform.

To trial pilot carbon credit management platform by 3 program experts have comment and suggestion about platform.

Connectivity, all of them agree that the pilot platform can use for every unit in carbon credit in supply chain to communicate and show information. The platform should be an online database to easily connect. But concern about server down and schedule to backup information because information have a value and security.

Co-Operation, all of them agree that the pilot platform can use for every unit in carbon credit in supply chain to join and share information. The platform should be direct connect via platform such as telephone, SMS or Line. Recommend for Line Application, It's modern and cheap for service fee.

Co-Ordination, All of them agree that the pilot platform can use for every unit in carbon credit in supply chain to use and exchange information inside organization. The platform should be transfer or export information to other divisions for use. Example for print report information to CEO to decisioning about buy or sell carbon credits.

Information Transparency, All of them agree that the pilot platform can use for every unit in carbon credit in supply chain to input real and information from each organization. The platform should be real time information and can verify to approve information. But should be a system to log transaction for history and can find it later.

All of them agree that the pilot platform is clear and easy to use, not complicated with clear annotations, In terms of MIS and GIS of the platform, a selection of technologies that are suitable for Cloud Database, MySQL Server and Google Map to save costs and no license, the speed of the platform can be used quickly. But there concern a problem with the internet signal.

For additional suggestion for use, there should be log in to the platform in order to be able to check transaction log access later. Including complying with the law in collecting various information related next and should be a backup system to prevent data loss. For the practical implementation, it should be tested with various target groups and more data. Then debug the platform to be more complete before implementation. As well as should provide an instruction manual for users to assemble for easy use. Finally, debug platform from comment and suggestion, the prototype carbon credit management platform have complete developed

Carbon Credit Management Platform - (Carbon Credit Trading System)

Run Program

Data Sheet

Transaction ID	Transaction Date	Type	Seller ID	Buyer ID	Credit	Price/Unit	Total Price	Status
220702-1340	02/07/2022	Sell	1		50	500	25000	Waiting
220702-1338	02/07/2022	Buy		1	100	100	10000	Waiting

Add Transaction

Transaction ID: 220702-1340 Date: 02/07/2022

Type: Sell

Seller ID: 1 TK Soft Limited Partnership

Buyer ID:

Offer Credit: 50 Price/Unit: 500

Total Price: 25000 Baht

Remark:

Status: Waiting

Developed and License by THN Jirawichankorn TEL: 081-4311414 E-mail: tj@msg.honmail.com Username: THN Date: 14 July 2022, 20:51:51

This screen show all transaction of information about carbon credit and split sell and buy transaction. Platform can add, delete, edit transaction, every transaction have more details such as id, date/time, type, seller id, buyer id, amount of credit, price/unit, total price and status (waiting/complete).

Carbon Credit Management Platform - (Carbon Credit Trading System)

Run Program Add New QR

Company Criteria Transaction Criteria Google Map Show

Map Satellite

Company Profile

Company ID: 1

Company Name: TK Soft Limited Partnership

Address: 128/29

Contact Name: Mr. THN Jirawichankorn

Telephone: 081-4311414

Business Type: Program Computer

Remark:

Year: 2565 Net Credit: 100

Print Report Send Contact

Transaction ID	Transaction Date	Type	Seller ID	Buyer ID	Credit	Price/Unit	Total Price	Status
220702-1340	02/07/2022	Sell	1		50	500	25000	Waiting
220702-1338	02/07/2022	Buy		1	100	100	10000	Waiting

Developed and License by THN Jirawichankorn TEL: 081-4311414 E-mail: tj@msg.honmail.com Username: THN Date: 14 July 2022, 21:41:32

This screen show about geographic information system (GIS). Platform show information about company, value of credit and sell/buy transaction. GIS show location of company in google map. Platform can find company on many criteria (amount of carbon credit, price, etc.)

7.1 Conclusion

For the most opinion on the factors affecting carbon credit management in supply chain differed by interviewees in different processes, such as policymaker will focus on the factors that direct effect on policy. And carbon credit specialists will focus on management processes and want to be most efficient for use. Business-related will focus on confident of information because affecting business competition.

All of the opinions are consistent with fundamental factors that research is study (Connectivity, Co-Operation, Co-Ordination, and Information Transparency). That direct affect carbon credit management in supply chain. But each factor is weighted differently, Policymakers giving importance to the following order Connectivity -> Co-Operation -> Co-Ordination -> Information Transparency, Carbon credit specialists giving importance to the following order Connectivity -> Co-Operation -> Information Transparency -> Co-Ordination, Business-related giving importance to the following order Information Transparency -> Connectivity -> -> Co-Operation -> Co-Ordination and summarize giving importance to the following order Connectivity -> Information Transparency -> Co-Operation -> Co-Ordination.

For propose the Carbon Credit Management platform in carbon credit supply chain management, everyone agreed that should have the platform that is central standard and providing services for various benefits together. Due to the large number of relevant departments and business organizations with the growing number every year, there need the platform to link all related carbon credit information. Center organizations that come to manage information from whole country which has opinions for government agencies to create a common standard platform. Organizations use this platform to manage carbon credit information for more advantage competition and more opportunities for business.

In platform, have designed and developed that is modern and responsive to the factors of carbon credit management in supply chain, using technology that is suitable, modern and efficient compared to the investment in development. The opinions from program experts is totally agreement, the platform can use for carbon credit management in supply chain. But concern about how to propose a platform that focuses on the effectiveness of the platform.

7.2 Discussion

From factors affected on carbon credit management in supply chain (Connectivity, Co-Operation, Co-Ordination, Information Transparency). The results are consistent with the research that has been studied, but will differ in each sample due to the focus on different work systems.

From program evaluation standards use to create carbon credit management platform. By following the process correctly, the platform is efficient and responds to each factor. But in this research not use real data (value of carbon credit) that results is not all correctly and need to more practice.

To propose the Carbon Credit Management platform in carbon credit supply chain management will differ in each sample due to the focus on different work systems. Efficiency of platform is direct affect to carbon credit supply chain management and make more benefit to related organizations.

7.3 Recommendation

There are many factors that affect carbon credit management in the supply chain. In this research, focused on the fundamental factors (Connectivity, Co-Operation, Co-Ordination, Information Transparency), then created prototype carbon credit management platform are developed to trial and use. In the future, the platform should be developed to support various factors. Increasing the efficiency of the platform and improve carbon credit management in the supply chain. Follow with the government's policy to reduce amount of carbon credit and create new business opportunities. That will happen in the future.

The developed platform just a prototype of carbon credit management in supply chain. It has not been used in normal because carbon credit in Thailand is still new and not enough information to use for data management. But it is the starting point for carbon credit in supply chain management, which will bring more benefits in terms of carbon credit in Thailand. Therefore, the platform should be developed more function for support more system such as carbon credit market system.

8. References

- Fullarton, A. R. (2016). Renewable Energy Credits as Tax Deductions: Tax Accounting for the Renewable Energy (Electricity) Act 2000.
- Heuer, K., Kerdpitak, C. & Kerdpitak, N.(2021). Influencing factors to tourist decision in choosing service tourist attraction: case of northern of Thailand. *International Journal of Business Tourism and Applied Sciences*. 9(2), 40-46.
- Hua, Y., & Dong, F. (2019). China's Carbon Market Development and Carbon Market Connection: A Literature Review. *Energies*, MDPI, 12(9),1-25.
- Kenton, W. (2020). Supply Chain. Investopedia. Retrieved from <https://www.investopedia.com/terms/s/supplychain.asp>
- Lang, S., Blum, M., & Leipold, S. (2019). What future for the voluntary carbon offset market after Paris? An explorative study based on the Discursive Agency Approach. *Climate Policy*,19(4), 414-426
- Rezaee, A., Dehghanian, F., Fahimnia, B., & Beamon, B. (2017). Green supply chain network design with stochastic demand and carbon price. *Annals of Operations Research*, Springer, 250(2),463-485.
- Royal Decree. (1997). Royal Decree establishing the Greenhouse Gas Management Organization (Public Organization) BE 2550. Retrieved from http://thailaws.com/law/t_laws/tlaw16077.pdf
- The Revenue Department. (2011). Royal Decree on Tax Exemption (No. 514) B.E. 2554.
- Thailand Greenhouse Gas Management Organization (Public Organization). (n.d.). Buying-Selling Carbon Credits of T-VER Project. Retrieved from <http://carbonmarket.tgo.or.th/>.

Tongkaw, S. (2017). GIS Application Management for Disabled People. IOP Conf. Ser.: Mater. Sci.

Eng. 226 012112

Thongrawd, C., & Kardpitak, C. (2020). Energy Consumption, Co2 Emission and Economic growth in Asean Countries. Journal of Security and Sustainability Issues 9(January), 15-27.

United Nation Climate Change. (2015). Thailand's Nationally Determined Contribution Roadmap on

Mitigation (2021-2030). Retrieved from
<http://www.oic.go.th/fileweb/cabinforcenter38/drawer027/general/data0000/00000853>.

Yourmetter. (2020). Understand our world issues, take better actions. Retrieved from
<https://www.worldcentric.com/take-action/understanding-world-issues/>