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Policy network analysis on enacting process on the Climate Change Act in the UK: Through the Application of Social Network Analysis

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Abstract

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Since the adoption of the Kyoto Protocol in 1997 and its ratification in 2005, many countries have created various climate change policies to cope with Green House Gas (GHG) emissions reduction. However, no country has established the legal framework for emission reduction with target in the long-term. Nevertheless, the United Kingdom (UK) established the Climate Change Act in 2008 and set out a CO2 emissions reduction target by 2050. UK has set up a five-yearly carbon budget to meet the reduction target. Also, UK has organized the Committee on Climate Change, which provides scientific and political advice and recommendations to the UK government as an independent body.

This research answers the following question, 'Which factors have impacted the UK to establish the Climate Change Act?' For this study, the Policy Network Analysis and Social Network Analysis (SNA) have been used. The entire policy making process on establishment of climate change act in the UK is divided into three periods, which are identified as period of policy-suggestion, period of policy-discussion, and period of policy-legislation. For the source of SNA, articles from newspaper and broadcast are extracted. Through these research methods and data analysis, this study examines important actors, interaction, linkage structure, and change of policy network patterns and examines the process of change in line with these factors.

Based on the analysis, the most important actors turn out to be the government, the parliament and the Friends of the Earth (Non-governmental organization). The government agreed with the act but it did not put a strong stance on it. The Parliament including the Conservative party and the Liberal Democrat party supported the bill strongly and the civil society including the Friends of the Earth also played an important role in the policy making process on the enactment of climate change bill. In terms of interaction, the first coalition was formed within the civil society and the parliament respectively, and then second coalition was formed between the civil society and the parliament. Then they pressured government together. This coalition was not that strong in last period but the coalition of civil society consistently pushed the government with initiative led by the Friends of the Earth. Regarding linkage structure, openness and vertical were observed and pattern of policy network was issue network in the whole period of the policy making process. Additionally, release of the report based on economic and scientific

evidence was the one of the factors that influenced to policy making process.

From this study, it is evident that the enactment of law against climate change and the bond of sympathy across various sectors are important. Secondly, the role of the civil society is critical. Thirdly, economic support and scientific evidence are essential elements in this process. Lastly, the formation of coalition in pursuing the common goal is the key factor in the policy making process.

Keywords : UNFCCC, Climate change policy, Policy Network, Social Network Analysis, Climate Change Act
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I. Introduction

1. Research background and objective

Since the revolution of industry was started in end of 18th century, average of global temperature has been consistently increased until now. Due to this phenomenon, damage caused by global warming has been worse than before. Accordingly, the climate change has became the biggest issue on environmental problem in 21st Century by which biodiversity including human is extremely influenced. (Yun, Sun-jin, 2007)

To cope with this urgent global situation, the United Nations Framework Convention on Climate Change (UNFCCC), is an international environmental treaty, ratified in 1992 and entered into force in 1994. Continuously the Kyoto Protocol that was established under the UNFCCC formally has been considered as the strongest instrument to meet the goal which is lowering the global temperature.

Following the protocol, selected developed country, also known as Annex I are assigned the emission target and should put forth their effort into policy on climate change at domestic level. However, there is only a small portion of country met their assigned emission amount bound by the article within the protocol for period of first commitment (2008-2012). Although the second period of commitment is on progress, countries, including U.S. Japan, Canada and Brazil emitting a lot of portion of GHGs emissions withdrawn their commitment for the protocol. It certainly burdens for country to set the emission target bound by international treaty. At this moment, it seems that global effort in terms of mitigation on climate change is

loosing not only their past commitment but also the future we want.

In the situation, there was a country emerging with legally-binding emission target at domestic level. On 26th November 2008, UK became the world first country that set the specific emission target as an act by 2050. It is different kind of effort that has been made before. Usually many counties has declared their commitment on reduction of GHGs emission or established the target with Business As Usual (BAU) baseline which is controlled by projected emission. However, UK was the first country that established the Climate Change Act which is significant instrument to implement strong leadership in global society with making a big step forward with legally-binding and long-term target. Achievement of UK in terms of GHGs emissions is indeed impressive. Emission reduction assigned to UK under the first commitment period within the protocol is 12.5% against year of 1990. But, UK had reduced their emissions at 14.6% already in 2004 which is excess reduction. Furthermore, the progress of emission reductions in UK was stepping forward continuously with 14% amount of emission reduction in 2013 compared to year of 2007 when one year before the act was established in 2008.

Establishing the legally binding instrument with specific emission target in terms of GHGs had never been seen before because it would be tremendous burdensome especially for economic growth. However, the policy-making process on the act in UK was exceptional case that is rarely seen. As public voice for climate change bill increased, NGO represented their voice and parliament took their proposal into consideration seriously. Also, confederation of corporation expressed their position and even artists in cultural sector participated in a noticeable massive movement occurred in UK

surrounding the climate change act. Indeed it was dynamic and complex process.

For this reasons, this study raised the fundamental question, 'Which factors have Impacted the UK to establish the Climate Change Act?' And Four major and specific objectives that are identified that (1) which one was the most important actor; (2) how the actors interacted and affected to each other; (3) what types of linkage structure existed in the process on policy-making of CCA; (4) Which patterns of policy network appeared in process of policy-making.

Through this analysis, the lesson learned from former process of the CCA in UK is able to provide a significant implication.

2. Research subject and range

The purpose of this study is to identify the context and factors in the establishment of the CCA by examining the actors, interaction and structure in the process. Accordingly, three instrumental backgrounds which are the UNFCCC and Kyoto Protocol, climate change policy in UK and the Climate Change Act will be reviewed to find the external factors and context. Through looking into UNFCCC and Kyoto Protocol, the flow of policy on international climate change will be identified. And Reviewing the UK's climate change policy is necessary work to capture the domestic context. Lastly, examining the CCA provide the evidence why analyzing the process of establishment of this act.

The time frame of this study is from 2005 when 'Big ask campaign was established to November 2008 when the CCA is

established. The reason that Big ask campaign is starting point of this study is that the discussion of need for legal framework on CO2 emission reduction has begun with the campaign.

3. Research methodology

This study uses the quantitative approach by using the Social Network Analysis (SNA) to figure out the unit of analysis in Policy Network Analysis (PNA).

To collect the data for SNA, 410 pieces of newspaper are searched and accomplished text analyzer to extract the actors. And the actor is considered as a node for SNA. After setting out the relationship among nodes, the nodes listed up in the Excel as data for SNA. Through SNA, the statistical value is interpreted in line with level of units in PNA which are identified as the most important actor, interaction, and structure. In terms of interaction, SNA has limitation on it hence interaction will be studied with contents analysis as complementary tool. And sociogram that is drawn by SNA will be reviewed as well.

To proceed the data analysis, data is coded with Microsoft Excel 2013 and SNA is conducted with UCINET 6.0. Lastly, Netdraw is used to draw sociogram based on result from UCINET.

III. Theoretical background and analytical framework

1. Theoretical background

1) Policy network analysis

Policy Network Analysis (PNA) emerged as a meso-level framework for policy theory and analysis. The PNA is created to overcome the theoretical limitation of pluralism and corporatism that was useful analytical tool to explain the policy process from 1970 to 1980. Pluralism insists that policy is the outcome of compromise and negotiation made from equilibrium while diverse group pursues their value and interest. Meanwhile, Corporatism put hierarchy and mutual cooperation as a key concept. Accordingly, corporatism views that the policy is the outcome made by active role of government official and limited specific group.

However, entering to the end of 1980, pluralism and corporatism was not able to explain the policy-making process by being increased the policy actors and blurred the boundary between government and civil sector. For this reason, PNA appeared as a alternative to explain the diverse actors, interaction among them and linkage structure dynamically. It is based on the understanding that policies are not shaped solely by governmental agencies but are rather outcomes of some sort of interactions and relations between governmental agencies, private sector actors and civil society actors. The PNA usually include “all actors involved in the formulation and

implementation of a policy in a policy sector. They are characterized by predominantly informal interaction between public and private actors with distinctive, but interdependent interests, who strive to solve problems of collective action on a central, non-hierarchical level" (Borzel 1998: 260).

There are several units of analysis for PNA. To explain the policy-making process, The following question needs to be answered which are identified that 'who is the major actors, and what interests they are pursuing?'; 'How they interact, and who's influence is the most powerful?'; 'which network that the actors make interaction to each other?'. Therefore, defining the unit of analysis is the first work to identify for this study. Many scholars have mentioned the unit for the policy network analysis.

<Table 1> Views for the components of policy network

Scholar	Components of policy network
Rhodes & Marsh (1992)	membership, integration, resource, power
Jordan & Schubert (1992)	actors, linkage, boundary
Waarden (1992)	actors, function, structure, conduct, institutionalization, power relations, actor strategies
Knoke et al. (1996)	policy domain, policy actors, policy interests, power relations, collective actions, policy outcomes
Yang, Jae-dae (2003)	actors, interaction, linkage structure
Kang, Dong-wan (2008)	actors, interaction, linkage structure, power

Yet, there is no universal components in PNA. This study adopt 3 major units of analysis which are actors, interaction, and linkage structure that used in the other study commonly.

The policy actor, as the fundamental unit in analyzing the policy network, means participant in policy-making process with aiming for reflecting their interest or opinion into policy outcome. (Waarden, 1992) the type of policy actors involved in policy-making process is classified to governmental and non-governmental actor, institutional and non-institutional actor, and formal and informal actor. The size of actors is also important factors to be considered. the size is determined with the number of actor who participates in. Identifying the leading actor is another crucial matter in examining the dynamics of actors. According to Rodes and March (1992), the leading role depends on degree of the resource and power the actors have.

Second unit of analysis is the interaction. Policy network means the shape of linkage made of interdependency among the actors involved in specific policy area. (Jordan and Schubert, 1992). In short, policy actors are interacting to each other while the policy-making process is on passing to the decision. In the process, the interaction among the actors encourages to exchange the belief, interest, desire, resource and strategy. Due to this process, actors change their stand or relations among them by which the interaction of actors influence to policy-making process. (Nam, Gung-Guen)

Last unit is the linkage structure. this, considered as pattern of relations (Waarden, 1992), is able to show the form or shape of network structure in which the interaction among the actors occurs. The linkage structure is constructed by degree of openness and direction of power flow. the fact of whether the structure has openness and closeness is important to analyzing the policy network.

If the degree is rising, the opportunity encouraging the diverse actors into policy-making process will be increased. Also, frequency and channel of interactions among the actors including the policy-learning, discussion on the policy, and exchange of resource or strategy will be increased followed by the openness. The other component to be looked in the linkage structure is the direction of power flow. this is observed from type of linkage affected by interdependency among actors. By examining the direction, we can find out the structure of network is whether horizontal or vertical.

<Table 2> Main components and contents of PNA

Components of network	Units of analysis	Analysis contents
Actors	Level of actors	Individual, (Non)Government, Public, Group
	Centrality	Degree Centrality Betweenness Centrality Eigenvector Centrality
	Stance of actors	Pro/Con, Indifference
	Participating time	When actors are in and out?
Interaction	Solidarity/Conflict	Mutual cooperation/conflict
	Direction	One-way/Two-way
	Contents	Key agenda or resource
Linkage Structure	Centrality	Degree Centrality Density Distance among actors
	Openness	Open/Close
	type of relationship	Vertical/Horizontal
	Centralization	Level of (de)centralization
	Level of structure	Characteristics of whole structure

Source: reconstruction based on Ko, Gil-gon, 2007

Through examining the feature of linkage structure, the pattern of policy network can be classified into 'issue network' which is loosen relations among the actors and 'policy community' that the relations is strongly tied. In the issue network, conflict of opinion exists and delivers information and knowledge to more actors due to flexible channel and contact frequency. Meanwhile, there is firmly binding trust among the actors through which exchange of information and knowledge occurs in policy community.[1] These types of network affects to policy-making process directly and indirectly.

<Table 3> Pattern of policy network

Dimension \ Pattern		Policy community	Issue network
Actors	Size	limit, exclusive for specific actors	no limit, open
	Type of interest	professional, economic	extensive interest
Inter-action	mutual consent	All the actors share the value and intake legitimacy	mostly agree but conflict exists
	Frequency	All the actors interacts frequently	frequency and intensity of interaction fluctuates
	Resource	All the actors possess the resource	A few actors possess the resource
Structure		Balance of power, equality of authority	Inequality of authority

Source: reconstruction based on Marsh & Rhodes (1992)

1) "The type of networks can vary along a continuum according to the closeness of the relationships in them. Policy communities are at one end of the continuum and involve close relationships and issue networks are at the other end and involve loose relationships" (Marsh and Rhodes, 1992)

Based on above review for PNA, the PNA, enabling to identify the actors, interaction, and linkage structure observed in the establishing process of climate change act seems to be effectively useful model. However, some of scholars pointed out that there is some of limitation on PNA. Sabatier (1991) and Peters (1998) said that "the missing linkage between network models and models of the policy process. and on the lack of attention to the dynamics that motivate actors within the network and acts as a catalyst to the process" Indeed, there is no components to capture the dynamic aspect of policy-making processes, the manner through which one stage leads to the following and also the interdependencies between the stages. For this reason, research adopting the PNA tends to identify policy outcomes by focusing on the characteristic of one dominant network and is incapable to divide policy stages. (Yael Parag, 2006) Besides, Dowding (1995) has pointed out that PNA has difficulty in analyzing the reality because the theory is not able to provide the power of causal explanation.

In spite of limitation of PNA, analyzing the enacting process of the Climate Change Bill by using the PNA has strong exactness and relevance. In this study, I will examine that which actors were the most important key players and that how those actors related and interacted with each other in the policy process. Also, structures including frequency of consultation, involving opportunity for diverse interest group and degree of openness will be another major unit of analysis.

2) Social Network Analysis

(1) Concept of social network analysis

Social network analysis (SNA) is defined as a method based on the assumption that relationships among interacting units are important. It is further said to encompass theories, models, and applications that are expressed in terms of relational concepts or processes. (Wasserman and Faust, 1994). The objective of SNA is to explain the interaction of units and characteristics of systems through examining the feature of type of network.(Kim, Yong-hak, 2007) And Mitchell (1969) demonstrated that SNA is the trial of explaining social interaction among actors through characteristics in specific network. Thus, SNA is known as useful tool to analyze the complex relationship among actors in particular network that is difficult to be explained by contents analysis. Also, It has advantage that relationship of actors who participating in certain network in manner of statistical analysis. (Ko, Gil-gon, 2007) Furthermore, SNA is useful to study attribute of actors involved in network. (Scott, 2000)

For this reason, SNA enable the Policy network analysis (PNA) to be enriched by analyzing the complexity due to network in comprehensive way. Accordingly, SNA is suitable tool for the policy network analysis of enactment of climate change act in UK.

And there are three types of network in SNA which are classified as complete network, egocentric network, and quasi network. Complete network is presented as binary whether interaction occurs or not. Egocentric network is the method that data is given from the information provided by correspondent. Quasi network can be used by setting the interaction or relationship in artificial way even if there was no direct interaction among units. Thus, quasi-network is widely adopted for a reason that data can be used by reconstructing the existing data in social science. (Kim, Yong-hak, 2011) Accordingly, quasi network is used for this research.

(2) Core concepts of SNA

Firstly, the representative indicators for solidarity of network are degree and density. Degree is defined as number of other nodes tied with a specific node. The higher degree of nodes is considered as more important. And this node has more resource and play a key role in the network. Also, if the nodes that is considered as high degree is removed, network would be collapse. Density is defined as actual tie among fully possible tie. Density tends to be lower if size of network is increased. In this research, density is used to figure out the structure of network.

Secondly, Centrality indicates that degree of node placed in network centrally thus it means the status of node. Centrality is one of the most used indicators to represent the authority and influence. According to Freedman (1979), centrality is divided into local centrality and global centrality. Local centrality is higher if a node connected to a lot of nodes surrounding it. In contrast, Global centrality is higher if a node is embedded in core part of network. There are several way to measure the centrality of network.

'degree centrality' is useful indicator to see local centrality. If a node receive influence or is pointed out from other node, it's called in-degree centrality. On the contrary to this, if a node give influence or points out to other node, it's called out-degree centrality. The second measurement is 'betweenness centrality' which enables to indicate which node is positioned among the other nodes. this indicator measures degree of role as broker or catalyst among the actors. The third measurement is 'eigenvector centrality' and it's also called prestige index. this indicator shows that which node is tied or interacted with the most authoritative or influential nodes.

Based on above concepts, actor who has high degree centrality will be the most important actor. And actor who has high In-degree centrality will be the most actor who received influence and actor who has high out-degree centrality will be considered as the most actor who actively give a influence to the other actor. And actor who has high betweenness centrality will be policy broker or catalyst in the network. Lastly, actor who has high eigenvector centrality will be the one who has interaction with the most influential and authoritative actors.

Thirdly 'Centralization' indicates degree that whether shape of whole network is centralized or not. Degree centrality focused on how node is placed in core part in network. However, Centralization measure how the whole network is formed centrally. And 'Geodesic distance', is also called as path distance, means number of least steps to reach to each other nodes. It measures immediacy and efficiency of information delivery. In this research, Centralization and Geodesic distance will be used to see structure.

2. Literature review

Prior to this study, two categories of literature has been scrutinized. The first category focuses on what type of models has been used and what conclusions have been reached on the pre-research in the policy-making process of the climate change act in UK. At the second one, studies applying policy network analysis in climate change policy is reviewed.

1) Studies of policy making process for Climate Change Act

According to studies of Hyung-jin Kim & Hyung-jun Hwang (2009), they insists that the most major factor to enable the establishment of climate change act in UK could be successful was the impact of "Stern review on the economics of climate change" Since the target of UK climate change program which had been launched in 1994 was considered to be unachievable in 2005, discussion related to instrument of climate change flowed toward that accepting the need of legislative effort for climate change. The authors point out that Stern review made an strong impact on consistent discussion for enacting and created a great sensation by providing economic evidence. Additionally the target of emission reduction by 2050 was 60 per cent reduction against the 1990 base line at the early version for the draft. But the target of final version of bill has been changed to 80 per cent reduction. The authors mentioned that modified target of emission reduction shows the another strong impact caused by Stern review on legislative process of the bill in UK because the Stern review was referred frequently in report of UK House of Commons Environmental Audit Committee claiming the 80% per cent reduction for the target is vital. But while they insisted that Stern review was the influential element on enacting the bill, they admitted there was a lack of empirical approach in their analytic methodology.

Colin T. Reid (2013) is the another author agreeing that Stern review was the major leading component to the proposal for a Climate Change Bill. In his article introducing and comparing with the act in UK and Scotland, he insists that conclusion of Stern

review on the economic case for action made government forced to prepare legally binding instrument on climate change policy. he also mentioned that the bill was thoroughly scrutinized in the UK Parliament through the economic evidence based on the Stern review.

Alex Bowen & James Rydge (2011) focused on 'dash for gas' which is that privatization of the electricity accompanying the changing structure of electricity production as a main background that UK could achieve the establishment of the act. Due to this shift of resource use in electricity industry, main resource for the electricity replaced from oil to cleaner energy sources, especially gas which led to reduce GHG emission in UK. With this unintended situation in UK, the authors evaluated that UK gained a firm foothold in the climate change area to have ambitious target in terms of reduction of carbon emission.

Despite there are many researches studying on climate change policy in UK, there were only few studies have been conducted on climate change act in UK especially focusing on future impact or effectiveness of the act. In accordance to literature review of pre-studies on the process of establishing the act, the main factors of the process turned out to be both of that 1) analysis and dissemination of Stern review which closed a gap between environmental issues and economic evidence, enabling all the stakeholder would discuss and make a decision better. 2) windfall situation to set up an ambitious target in reducing emission resulted from transition of resource use in producing electricity.

These results seem to be convincible. But they have limited results by adopting case study and literature research without any model or theory as a research framework. In other words, no empirical analysis on establishment of the climate change act

conducted without using level of analysis such as identifying actor or interest group, interdependency in decision-making and pattern of policy-making.

2) Studies applying policy network analysis in climate change policy.

Han, Jin-i & Yun, Sun-jin (2010) analyzed policy network among actors in establishing ETS through the application of Social Network Analysis. What a remarkable part in this study is that they use the quantitative analysis in which they found main actor in the policy-making process by conducting a survey with 91 responded answer.

Lee, Dong-ho (2008) analyzed establishment and development process of international environmental regime with a case study on the Kyoto Protocol and United Nations Framework Convention on Climate Change (UNFCCC) by adopting the PNA. He tried to figure out trait of party, considered as a main actor, and interactive relationships including strategic interaction, network structure, and policy learning among actors in process of policy network. As a theoretical frame for analysis, the study used the 'Rational Choice Institutionalism' approach in which an actor model explains the actor's interests and characteristics as a key player of UNFCCC.

Lastly, Byun, Jong-rip (2010) attempted to analyze both the characteristics and types of policy networks in the process of the introduction of ETS into Korea. For this purpose, the article employed an analytical method combining with the policy network theory and Advocacy Coalition Framework (ACF) model. Also, he used some of components from the reversals of fortune model and the policy stream model to elaborate the combined model. Through this, he

analyzed policy stream firstly and attempted to apply combined model of the ACF and PNA.

Until now the subject, policy-making process on establishment of the climate change act in UK, has not been covered in spite of it's unparalleled dynamics in the enacting process and significance of the act. This type of act has never been found in any other countries because reducing the emission through concrete target with legally binding manner is not favorable way for the countries in consideration of economic impact. Therefore it will be a significant work if main actors, interactions among the actors and structure would be figured out through the network analysis. Besides, rather than covering the climate change policy in UK generally , focusing on the climate change act specifically will provide higher reliability and depth concerning the policy-making process of act.

In terms of policy-making process, existing researches related with climate change policy has focused on ETS. And the most frequently used model was the PNA. According to Ko, Gil-gon, discussion on PNA based on the question to find out which actor take lead in policy-making process or decision-making. Hence, employment of PNA is not limited to specific area.[2] Also, main analytical approach for PNA was qualitative study such as case analysis or contents analysis. However usefulness of SNA for PNA is proved by recent study and SNA makes PNA to be analyzed with empirical way not like before. For this reason, this research employ SNA to analyze policy network on policy making process of establishment of climate change act in UK.

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2) Ko, GIl-gon argue that PNA is widely used not only for policy making process or decision making process but also for system of service delivery and policy implementation after collecting and analyzing use of SNA in PNA study.

2. Research Design

1) Analytical framework

(1) Research model

In this research, policy-making process of establishment on climate change act in UK will be examined through Policy network analysis (PNA) by using Social network analysis (SNA).

Firstly, components of PNA will be analyzed. In terms of actors, level of actors, stance of actors and participating time of actor are identified. And relationship of solidarity and conflict, direction, and contents are figured out with regard to interaction. For the linkage structure, Centrality, Openness, type of relationship, centralization and level of structure are examined.

Secondly, analysis on identification of actors and linkage structure is proceeded through SNA. In terms of data for the analysis, Newspaper and broadcast published from 1st March 2005 to 1st December 2008 are collected and reviewed. The keyword for search engine was “climate bill”, “climate act”, and “climate law” Through the search of newspaper and broadcast, 410 articles are found. The articles listed by period in Excel and put all the articles into text analyzer and extracts the actor. In terms of actors, they are set limits to group, party, and organization except prime minister and Nicholas Stern. Extracted actors listed in Excel as data matrix for UCINET 6.0. And If evidence that a actor give influence to the other actor from the articles, it’s coded as ‘1’ Through analysis by UCINET 6.0, statistical values such as centrality, density, centralization, and Geodesic distance came out and draw sociogram by using Netdraw.

Through this research model, the research question for verification is as in the following.

Research Question 1. Which actors was the most important actors in policy making process of enactment on climate change act in UK
Research Question 2. How the actors interacted with each others in policy making process of enactment on climate change act in UK
Research Question 3. What is the characteristics of structure in policy making process of enactment on climate change act in UK
Research Question 4. Which pattern of policy network appeared in policy making process of enactment on climate change act in UK

(2) Periodical range of analysis

The purpose of this study is to analyze the actors, interaction, and linkage structure revealed from policy-making process on establishment of the Climate Change Act by adopting PNA and SNA. Through this models, this study attempts to figure out the key actors, interaction and structure by time framework. To conduct the analysis by time flow, the discussion of policy process theory is necessary.

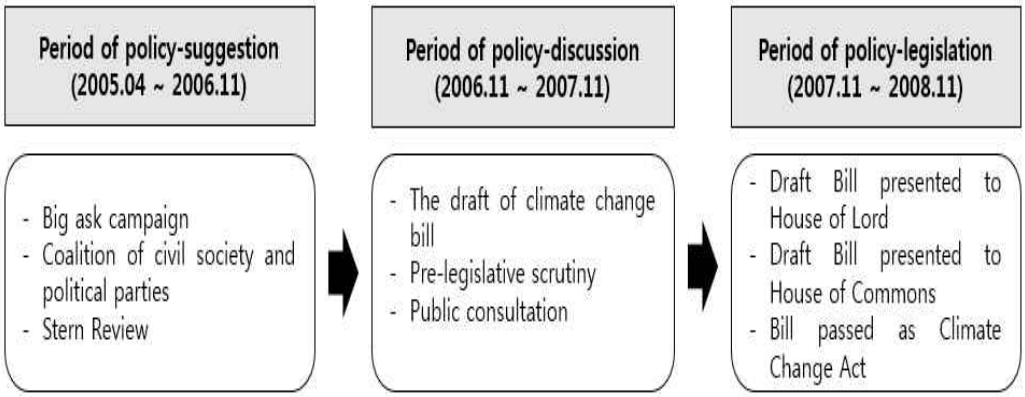
Policy process theory indicates broad range of policy-making process including setting goal, analysis of alternative option, decision-making, legislation, implementation, evaluation and end of policy since emerging recognition of policy issue as shown in <Table 5> (Yang, Seung-Il, 2006). Many scholars have discussed particularly on policy-making process.

<Table 4> Policy making process

Scholar	Policy making process			
Lassewell (1956)	Information	suggestion	prescription	
Anderson (1975)	recognition of issue	agenda -setting	policy-making	policy adopting
Jones (1977)	defining issue	development	legislation	
Dye (1981)	recognition of issue	policy option decision	legislation	
Hogwood & Peters (1983)	agenda setting	policy-decision	legislation	organization
Palumbo (1988)	agenda setting	policy-decision		

Source: reconstruction based on Yang, Seung-il, 2006

Based on above classification for policy-making process, this study will classify the time flow of whole policy-making process into three periods which are period of policy-suggestion, period of policy-discussion, and period of policy-legislation by synthesizing the theory of policy-making process. The first period was emerging from 7th April 2005 to 15th November 2006. In this period, various actors urged that the climate change bill should be adopted by government. The second period started from 16th November 2006 and ended on 14th November 2007. In this period, actors discussed the contents and provision of the bill through various way. Last period was from 14th November 2007 to 26th November 2008. In this period, Parliament reviewed and approved the bill to the act as it was legislative process.



<Figure 1> Policy-making process for Climate Change Act in UK

(3) Unit of analysis

In this research, units of analysis in Social Network Analysis (SNA) are centrality, density, centralization, and degree of linkage. For analysis of centrality. 3 types of centrality are used. 'degree centrality' will indicate level of actors's importance. As a part of degree centrality, 'In-degree centrality' will indicate how the actor is influenced by the others and 'Out-degree centrality' will show how the actor influence to the others. And 'Betweenness centrality' will identify which actor played a role as broker or catalyst among actors. 'Eigenvector centrality' will indicate which actors had interaction with the most influential and authoritative actors.

To look for structure, density, centralization, degree centrality and geodesic distances. Through density, degree of dense among actors and size of network will be identified. And centralization will show how the entire structure of network is centralized. In contrast, degree centrality will indicate how actors are placed in core part in network hence it show local centrality not like centralization that

show global centrality. Lastly, geodesic distances will show immediacy and spread power of information exchange.

<Table 5> Units of analysis in SNA

Network	Units of analysis	Indicator	Analysis contents
Quasi-Network	Centrality	degree centrality	The most important actors
		In-degree centrality	The actors are influenced by the others
		Out-degree centrality	The actors influencing to the others
		Betweenness centrality	Actors who are broker or catalyst
		Eigenvector centrality	The actors who interacts with the most influential one
	Density	Degree of dense	Dense of network
	Centralization	Degree of centralization	Centralization of entire structure in network
	Geodesic Distance	Number of steps to reach	Immediacy and spread power of information exchange

Units of analysis in Policy Network Analysis (PNA) are identified as actors, interaction, and linkage structure. Units of actors and linkage structure will be identified through SNA. However, interaction is difficult to be found out by SNA. Therefore, contents analysis will be used complementarily.

With this manner, key actors will be analyzed and categorized as Government/Parliament (GP), Non-governmental (NG) sector and Business and Industrial (BI) sector.

2) Data collection

This study uses Social Network Analysis (SNA), as a quantitative analysis, to identify the components of Policy Network Analysis (PNA). In this study, Quasi-network that sets up relationship of network artificially by using the existing data is adopted. Therefore data for this analysis is extracted from articles of newspaper and broadcast. Interview and survey are frequently used method for data collection but it will not be adopted due to difficulty of access.

According to Audit Bureau of Circulations in UK, only daily newspapers with circulations of more than 100,000 copies per day in 2014 are as in the following; The Sun, Daily Mail, Daily Mirror, Evening Standard, Daily Telegraph, Daily Express, Daily Star, The Times, I, Financial Times, Daily Record, The Guardian, The Independent. Among them, Evening Standard and Daily Record are excluded as these are local newspaper and Scottish newspaper respectively. 'I' is tabloid version of The independent and Financial Times focuses on financial and economic issues. And main articles of Daily Star is about entertainment or Gossip. Accordingly, these four newspapers are ruled out.

The key words for searching engine are 'climate law', 'climate bill', and 'climate act' and searching range is from 1st March 2005 to 1st December 2008. After articles are collected, whole contents of article is put into text analyzer and then name of the actor is extracted. these actors listed in Excel file and coding proceeded with examining the articles. And four analogue terrestrial broadcast of television which are BBC, ITV, Channel 4 & 5 proceeded in same way with newspaper.

<Table 6> List of newspaper and broadcast of television

	Name	Political view	Circulation 2014
News Papers	The Sun	Moderation	2,213,659
	Daily Mail	Conservative	1,780,565
	Daily Mirror	Labour	992,256
	Daily Telegraph	Conservative	544,546
	Daily Express	Conservative	500,473
	The Times	Conservative	384,304
	The Independent	Moderation	364,842
	The Guardian	Labour	207,958
TV	Name	Political view	Viewing rate
	BBC	Unidentified	31.8%
	ITV		22.6%
	Channel 4		11.3%
	Channel 5		5.9%

Source: Audit Bureau of Circulation in UK

Besides SNA, this research referred to literature material to grasp context behind newspapers. Firstly, materials including document, report, media release, and visual representation covering the process on establishment of the Climate Change Act are collected regardless of informal and formal materials. By reviewing these information, I was able to not only understand outline and context of the process but also recognize the critical moment or report considered as big steps or trigger toward shift.

Following this stage, I examined theoretical book explaining the PNA and SNA, dissertation paper, journals, report from institute and NGO to secure the data and information for analysis in line with

units of analysis. Also, I collected policy brief, executive summary, full report, speech notes released and written by government related with this act such as Department for Environment, Food and Rural Affairs (DEFRA), Treasury, Committee on Climate Change and the other department that speaks up their voice on the enacting process.

And the establishing process of the Climate Change Act is the law not just policy. Accordingly, materials from discussion of parliament and legislative process was another crucial resource. Especially, it is the main archive for the third period. which is called period of policy-legislation in this study, because the third period occurred from when the bill was proposed to parliament.

Fortunately, materials for policy on climate change in UK is incredibly preserved and found easily. And there were several alterations of department relevant with environment, making the department disappeared and created. But, archive of former government on web site was still accessible. And NGO based in UK shows impressive activities including publishing well-written report and interesting outreach strategy. Lastly, academic institute studying on policy of climate change in UK is abundant. And their fact-based critical review, report and journal truly enriched the quality of my data and information with high credibility and social-scientific evidence.

III. Institutional background

1. United Nations Framework Convention on Climate Change and Kyoto Protocol

The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty negotiated at the United Nations Conference on Environment and Development (UNCED) held in 1992. The Convention was opened for signature in 1992 and gained a sufficient number of ratification to enter into force in 1994. It currently has 196 Parties, including the European Union and United States. The Kyoto Protocol (KP) was established under the UNFCCC formally.

The ultimate objective of UNFCCC is to stabilize greenhouse gas (GHG) concentrations in the atmosphere "at a level that would prevent dangerous anthropogenic interference with the climate system."[3] Through the aim of returning to their 1990 GHG emission levels by the year 2000 all parties have committed themselves to adopting national policies and implementation on the mitigation of climate change by putting their effort to reduce their emissions.

A fundamentally and frequently used principle in the UNFCCC is that developed and developing country Parties should note in their mind of "common but differentiated responsibilities and respective capabilities,"[4] reflecting a view that developed countries bear a greater historical responsibility for the accumulation of GHG emissions and have greater capacity to take action. Thus, the UNFCCC separate the Parties into two main groups that are identified the Annex I countries, which is comprised of developed countries, and the non-Annex I countries, which os comprised of developing countries.[5] With this division stated under the UNFCCC in which parties are bound by certain commitments general and article to all Parties, and GHG emission reduction target with specific

3) UNFCCC, ibid. at art. 2.
4) UNFCCC, ibid. at art. 3.1.
5) UNFCCC, ibid. at art. 4.2

targeted year was assigned certain additional obligations to the Annex I Parties.

The secretariat should convene the Conference of the Parties (COP) that shall keep under regular review the implementation of the Convention and any related legal instruments that the COP may adopt as a form of its plans. mandates and decisions should encourage to promote the effective implementation of the Conventio n.[6] The COP is held annually and COP 20 and 21 will be opened in Lima, Peru and Paris, France respectively.

UNFCCC has made several achievements stepping forward to meet the ultimate goal which is to reduce the GHG emission against global warming at international level within the convention. The first well-known commitment from the conventions was Kyoto Protocol, adopted in 2007, sets forth emissions targets for developed countries which are bound under international law. This protocol has 3 different kinds of mechanism to provide instrument enabling the reduction of GHGs emission. and the Kyoto Protocol has had two commitment periods, the first of which lasts from 2005-2012, and the second 2012-2020.

At the COP 13 held in 2007, Bali Action Plan was made. The plan encouraged the all developed country parties to set forth quantified emission limitation with reduction objectives, while ensuring the comparability of efforts among them, taking into account differences in their national circumstances.[7] At the COP 15 held in 2009, a number of countries produced the Copenhagen Accord. The accord made a clear statement that global warming should be limited to below 2.0 °C. This may be strengthened in 2015 with a target to

6) UNFCCC, ibid. at art. 7
7) UNFCCC, decision 1/CP.13, in COP 2008, p. 3

limit warming to below 1.5 °C. But the accord has no specific emission target with baseline and another problem lies on the legitimacy of agreed process. Only 114 countries have agreed to the accord and it means that the accord is not formally adopted by the COP. For this reason, chairperson in COP 15 used expression such as "took note of the Copenhagen accord." at the decision-making table.[8)]

two years later, the Cancun agreements were adopted by the COP 16 in 2010. The agreement states that global warming should be limited to below 2.0 °C against with the pre-industrial level. "This target may be strengthened on the basis of the best available scientific knowledge, including in relation to a global average temperature rise of 1.5 °C".[9)]

In spite of these efforts at global level against global warming within the framework, developed countries and the convention has received many criticism on a lack of specific emission target and actual implementation. Thus the parties adopted the "Durban Platform for Enhanced Action" in COP 17 held in 2011. As part of the Durban Platform, parties have agreed to "develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties".[10)] This new legal instrument that is supposed to replace the KP is due to be adopted at the 21st COP, and implemented in 2020. As this discussion continued to COP 18, the parties at situation of recognizing that current efforts to hold global warming to below 2 or 1.5°C relative to the pre-industrial level appear inadequate.

Based on brief review of the UNFCCC, it's undeniable that the KP is the current apogee of international efforts to overcome the

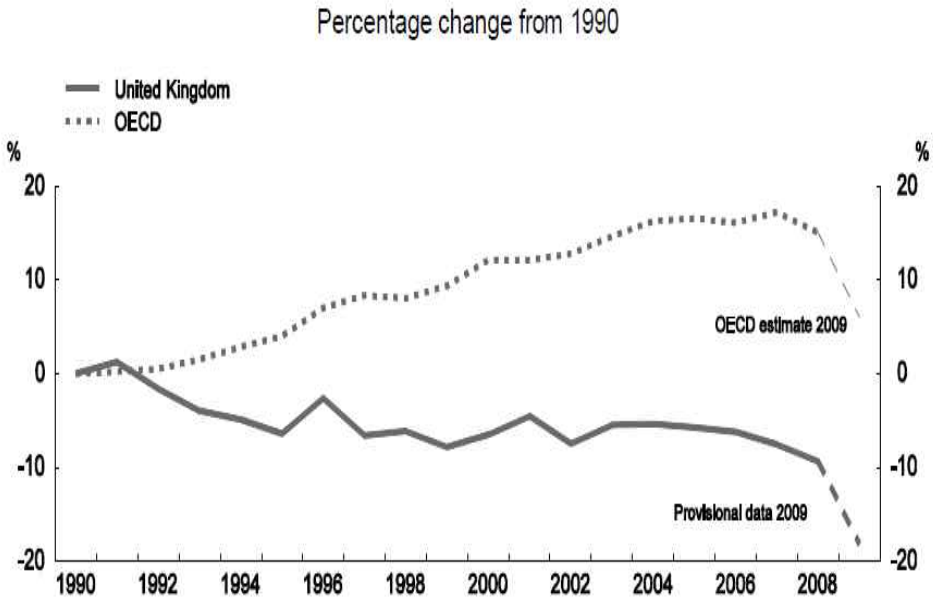
8) COP 2010, p. 5
9) COP 2011, p. 3
10) Paragraphs 2-4, in COP 2012, p. 2

damage from climate change and a significant milestone in terms of binding instrument affecting into policy on climate change at domestic level. The main goal of the Kyoto Protocol is to limit emissions of the GHGs. The KP sets forth binding emission limits for developed country Parties for the first period of 2008 - 2012. Parties have tried to put their effort in developing national measures to meet their limits. Furthermore, they can take advantage of certain "flexible mechanisms," which offer market-based approaches for achieving emission reductions in which the protocol had a major role as a internationally collective compliance system by implementing the enforcement mechanisms into national policy.

The major contribution of the Protocol is its quantified emission limitation and reduction commitments with legally-binding manner in which Annex I Parties under the UNFCCC should not exceed assigned emission of the GHGs. Aggregately, the assigned amounts of the Annex I Parties under the KP correspond to a 5.2 percent reduction below their 1990 emissions levels.

2. Climate change policy in United Kingdom

UK progress in reducing CO2 emissions has been impressive and much achieved compared to the OECD as a whole. Since 2007, there has been a major decline in both OECD and UK CO2 emissions, primarily due to the economic depression hit to Europe. (Alex Bowen & James Rydge, 2011) And gap of CO2 emissions is still gradually declining until 2009 as shown in <Figure 2>.



<Figure 2> Change in total CO2 emissions in the United Kingdom and the OECD

Source: IEA database, CO2 Emissions from Fuel Combustion (OECD estimate in 2009 extrapolated from Friedlingstein, et al., (2010)); UK Department for Energy and Climate Change (DECC) (2010), UK Emissions Statistics, with 2009 Provisional data.

In case of UK, net GHGs emissions fell by more than 20% between 1990 and 2006.[11]. And latest projections predict net emissions might be fell to around 23% below base year levels by 2010. In spite of these remarkable phenomenon, the UK economy has grown 48% from 1990 to 2006. The main sources for this reduction in emissions have been improvements in energy efficiency, energy supply and emissions of non-CO2 greenhouse gases as shown in <Table 7>.

11) It includes emissions allowances purchased through trading in the EU Emissions Trading Scheme.

<Table 7> Source and proportion of GHG emission reduction in UK

Share of UK emissions reductions, 1990-2004 (excluding EU ETS)	Source
35%	Improved energy efficiency
30%	Non-CO_2greenhouse gases
25%	Fuel switching (coal to gas)
10%	Fuel switching (other e.g. renewables & nuclear)

Source: United Kingdom Department of the Environment, Transport and the Regions, *Climate Change: The UK Programme 2006*, 2006

According to report published by UK government, most of striking part for emission reduction is due to 'Improved energy efficiency' and 'Non-CO2 greenhouse gases' Despite of some of critic s[12] in which the main factor of GHG emission reduction was fuel switching[13], there is no doubt that well-organized and facilitated policies of UK in fields of climate change and energy has performed effectively.

The first time when UK started to take the climate change policy seriously was 1989 in which Mrs. Thatcher's speech at the United Nations[14] placed the UK at the forefront of raising the issue

12) Bowen and Rydge (2011) argued that some of the success has been due to 'one-off' factors such as the 'dash for gas', reductions in non-CO2 greenhouse gases in the 1990s and the recent recession, rather than explicit climate change policies,

13) During the 1990s there was the significant shift by the newly privatized electric companies in the UK from fossil fuel towards natural gas in using the resources for generating electricity. for this reason, this phenomenon is called 'dash for gas'

14) Margaret Thatcher, Prime Minister, speech at the United Nations

of climate change. (Kim, Seong-jin, 2013) The following years significant policy documents[15] were produced, and significant reductions in emissions occurred, although these were the result much less of environmental concerns than of the economic tides that led to the decline of energy-intensive heavy industry and the 'dash for gas' as the newly privatized electricity industry built new gas-powered generating stations enabling to eliminate the ageing coal-fired plants. (Hollo, E, 2013). In this situation, the Non Fossil Fuel Obligation (NFFO) and the Scottish Renewables Obligation (SRO) were established in the same year under the Electricity Act 1989. original intention of the act was to support nuclear electricity generation, the NFFO and SRO were expanded in 1990 to include renewable. The NFFO and SRO were funded by a Fossil Fuel Levy paid by suppliers of electricity from fossil fuels.

In 1997, response of UK against climate change faced transitional phase with newly elected prime minister, Tony Blair from labour party. Before the election, he officialized the motto which is called 'a new environmental internationalism'[16] at manifesto held in 1996. After taking up his position, he took a lead the UK as a leading country which made a huge impact on climate change policies and actions internationally and domestically.

General Assembly on 8 November 1989

15) The UK Programme: United Kingdom's First Report under the Framework Convention on Climate Change, 1994

16) Part of manifestos of the UK's labour party (1996): "Labour believes that the threats to the global climate should push environmental concerns higher up the international agenda. A Labour government will strengthen co-operation in the European Union on environmental issues, including climate change and ozone depletion. We will lead the fight against global warming, through our target of a 20 per cent reduction in carbon dioxide emissions by the year 2010."

UK and Germany were the most well-known countries taking the lead in terms of climate change policy in European Union. UK contributed to establishing Kyoto Protocol by bridging the gap between US and EU[17] John Prescott, Vice-prime minister in government of Tony Blair, has actively coped with negotiation at UNFCCC and drawn the adoption of approach based on 'setting up the emission target and timetables' that EU had supported consistently.[18] Also, when entry into force of the Kyoto Protocol was confronted with a difficulty of withdrawal from US, the UK persuaded Russia to join for the protocol by ratifying it[19]. Besides UK took the lead to make an agreement of funding and technology transfer for the adaptation in developing countries in Conference of the Parties (COP) 6. In short, UK has been adapted to international pressure on climate change, in addition to, taken a lead as a leader. With this position, UK had performed in international climate change area as both of leader and complier.

In common with international level, these pacesetting endeavor

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17) When the Kyoto Protocol was negotiated, two basic options were on the table: "common and coordinated policies and measures" and "targets and timetables". One set of countries, led by the EU, was supporting that all countries implement specific policies. Another set of countries, led by the USA, was arguing for limits on national emissions. (WWF, 2005)

18) Sorolio, I, *The European Union as a Leader in International Climate Change Politics,* 2011

19) Article 25 of the Protocol specifies that the Protocol enters into force "on the ninetieth day after the date on which not less than 55 Parties to the Convention, incorporating Parties included in Annex I which accounted in total for at least 55% of the total carbon dioxide emissions for 1990 of the Annex I countries, have deposited their instruments of ratification, acceptance, approval or accession.". Joining of Russia was essential to meet the condition of entry into force of Kyoto Protocol as US give up to be membership of the protocol.

has been continued at domestic level, UK Climate Change Programme (UKCCP) was launched in November 2000 by lead of Department of the Environment, Transport and the Regions (DETR). The Government and the devolved administrations have therefore set forth a goal at domestic level to go further than the Kyoto commitment and cut the UK's emissions of carbon dioxide by 20% below 1990 levels by 2010.[20] The UKCCP was milestone on climate change policy in the way that it was the first actual strategy to reduce GHG emission and many of sub-program or implementation approach were introduced from the UKCCP. Despite these grand ambitions, delivery was not enough to meet the goal. By 2003, the government's own sustainability watchdog was pointing out that the UKCCP was failing to reduce total carbon dioxide emissions and also the projection of a 19% cut had been wildly over-optimistic.[21]

Besides, The Climate Change Program Review (CCPR) was initiated in 2004 by DEFRA to try and secure a ambitious goal of the UK back on track for its 2010 target. But, after two years of interdepartmental review, the final outcome was concluded that it's not able to meet the goal. Carbon reductions had stopped after 2000 and the measures came out in the CCPR were projected to only achieve a 10.6% reduction by 2010. Accordingly, the CCPR turned out to be deficient for the goal. Since then the UKCCP was updated in March 2006.

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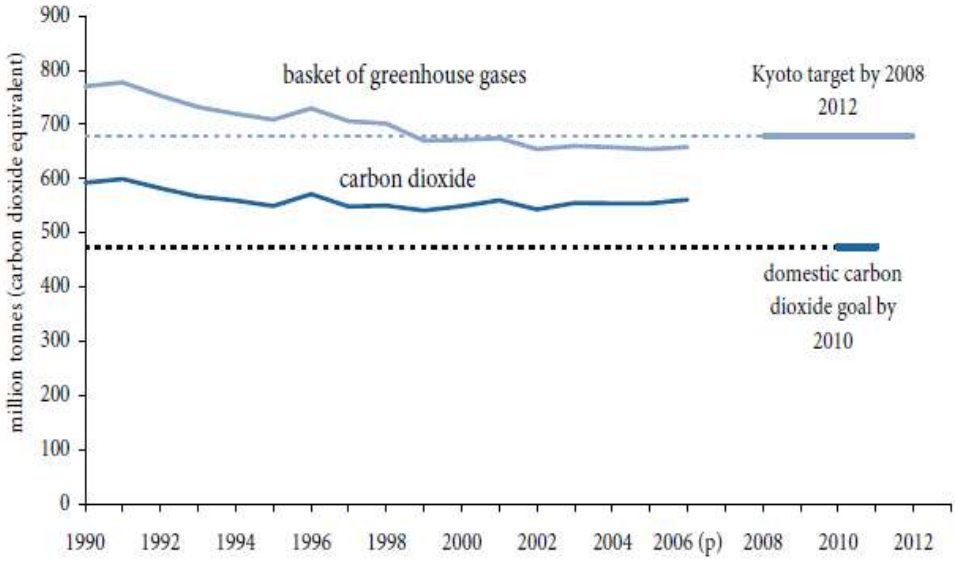
20) Department of the Environment Transport and the Regions, *Climate change The UK programme*, 2000

21) Sustainable Development Commission, *UK Climate Change Programme: A Policy Audit,* 2003



<Figure 3> UK annual emissions since 1990

Source: 'Emissions of greenhouse gases: 1990-2006 (provisional) United Kingdom', May 2007, DEFRA

By modifying the programme, the UK expected to reduce its carbon dioxide emissions by about 15-18% below 1990 levels as shown in <Figure 3>. Thus the government's domestic target which is set up as 20% below missed but achieved its Kyoto Protocol target, with a projected reduction of emissions including all the GHGs, not just carbon dioxide about 23-25% from 1990 levels.[22)]

The Climate Change Levy (CCL) that is a part of UKCCP's implementation tool was introduced on 1 April 2001, effectively replacing the Fossil Fuel Levy. It is a downstream tax on non-domestic energy use by industry and the public sector, designed

22) Department of the Environment Food and Rural Affairs, *Climate change The UK programme,* 2006

to promote energy efficiency and emission reductions, with part of the revenue being used to reduce national insurance contributions. Energy-intensive firms can receive up to an 80% (65% until April 2013) discount if they join a Climate Change Agreement (CCA), which requires meeting energy efficiency or carbon-saving targets. Renewable electricity suppliers are exempt from the CCL. Receipts from the CCL amounted to £0.7 billion in 2009.[23)]

In 2002, the Renewables Obligation (RO) replaced the NFFO and SRO as its role for the major renewable energy policy instrument. The RO requires electricity end-suppliers to purchase a certain fraction of their annual electricity supply from producers using specific renewable technologies, and they receive Renewables Obligation Certificates (ROCs) that is able to trade for doing so. The supplier can also buy out the obligation by paying a set price per MWh. The buy-out revenue is recycled to participating suppliers in proportion to their ROCs.

In 2005, the UK Emissions Trading Scheme closed in 2006 and was replaced by the EU, aiming at encouraging the member states of EU to comply with the Kyoto obligations. Under the EU system, National Allocation Plans should be submitted by member states to the European Commission by which a total amount of emission allocated with a set proportion for a member state's has been assigned from 2008 to 2012 to sectors covered by the standard under the scheme. As following step, tradable quotas were then divided into firms.

Lastly, the climate change act is established in November 2008.

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23) The Chancellor announced in the Budget that Climate Change Agreements (CCAs) will be extended to 2023, whilst the Climate Change Levy discount on electricity for CCAs will also be increased from 65 per cent to 80 per cent from April 2013.

This Act sets forth a legally binding target of 80% reductions in emissions to 2050. A medium-term target of a 34% reduction by 2020 was also adopted, with the possibility of promise for a further tightening in the international effort on climate change. To achieve these targets, the Act established the principle of five-year carbon budgets. The first three budgets were set in 2009 and cover 2008-12, 2013-17 and 2018-22. The fourth budget, 2023-2027, which was approved by the UK Committee on Climate Change in 2011.

<Table 8> Levels of the first four carbon budgets

	First Carbon Budget (2008-12)	Second Carbon Budget (2013-17)	Third Carbon Budget (2018-22)	Fourth Carbon Budget (2023-27)
Carbon Budget Levels	3,018	2,782	2,544	1,950
Territorial Emissions	2,877	2,556	2,166	2,089
Net UK Carbon Account	2,928	2,650	2,473	2,155
Projected performance against first four carbon budgets	-90	-132	-71	205
Uncertainty range	-95 to - 85	-178 to - 99	-142 to - 11	100 to 296

Source: Updated energy and emissions projections 2012, October 2012, DECC

The Government must submit its policies to meet these budgets to Parliament. The Act also requires the government to include aviation and shipping emissions which was one of the most arguable

area at the legislative process, or to provide an explanation why it's not kept.

Through this brief look, we found out that policy on climate change in UK has several features. Above all, the government provides well-balanced instruments in diverse areas including industry, household, and transport. And another strength is that the policy is integrated like package deal so that the degree of overlap or separation of the implementation tool would be lessened. And the government set up the goal or strategy on the basis of scientific and statistical data. this helps encourage the goal could be quantitative and also make the analysis of benefit and cost possible for the better policy-making process.

Yun, sun-jin (2007) had already pointed out that scientific achievement on climate change is one of the essential components for the policy in UK. This factor has been crucial in the way that scientific evidence ensures setting the specific emission target which consolidates actions. The last feature of climate change policy in UK is that the government tends to adopt the market-based approach. Because the government believes voluntary action is effective more than any other manners, instruments including levy, subsidiary and trade scheme has been the most frequently used in the history of UK policy on climate change.

3. The Climate Change Act 2008

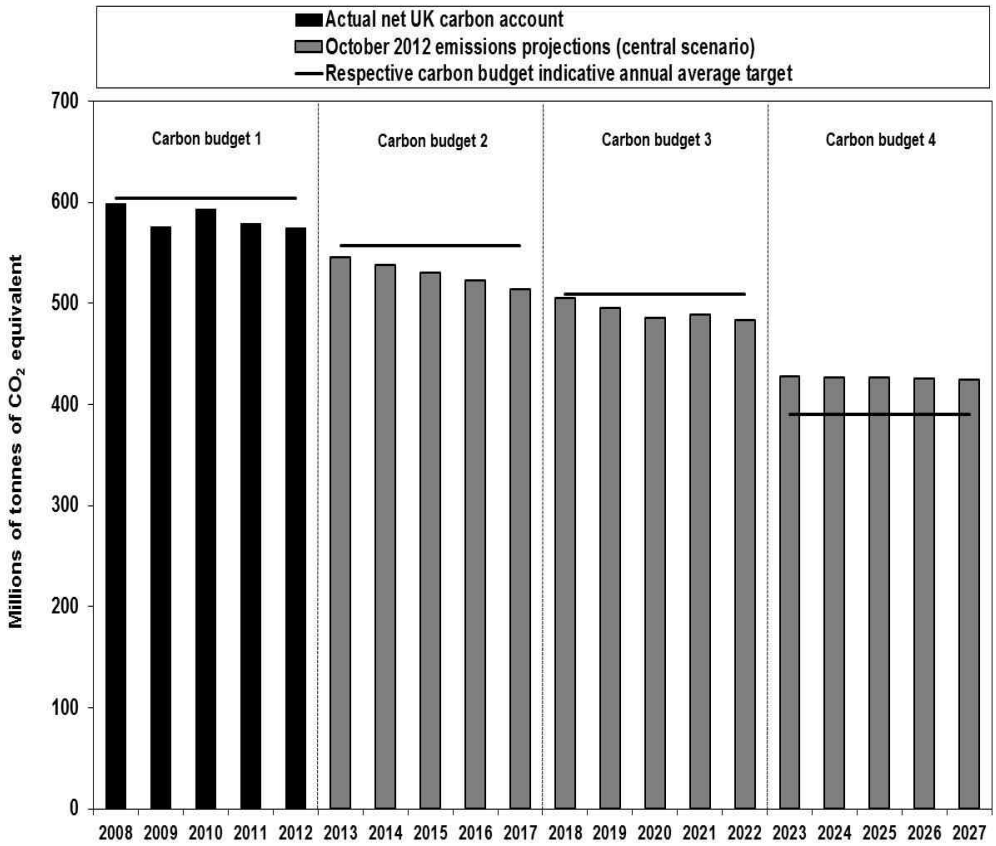
1) Overview of the Act

The Climate Change Act 2008 is an Act of the Parliament in the UK. The Act states that the duty of the Secretary of State to ensure

that the net UK carbon account for all six Kyoto greenhouse gases for the year 2050 is at least 80% lower than the 1990 baseline, toward avoiding dangerous impact by climate change. The Act aims to enable the UK to become a low-carbon economy and assigns ministers powers to introduce the measures necessary to meet GHGs reduction targets.

An independent Committee on Climate Change (CCC) has been created under the Act to provide advice to UK Government on these targets and related policies. In the act Secretary of State refers to the Secretary of State for Energy and Climate Change (DECC). The establishment of the act has two main purposes which are identified that (1) having a leading role in climate change at global level; and (2) enhancing the UK to transit into low carbon economy while improving the management of carbon emission. The Act has clear symbolic and practical value for the UK, both domestically and internationally.

The Act consists of 6 parts. Part 1 sets out the main goal of the legislation which is the 2050 target and the carbon budgets system. The Act establishes a legal duty on the government to reduce the UK's GHGs emissions by at least 80 percent below 1990 levels by the year 2050 as well as setting forth a medium-term target for 2020. Also, the government must establish a series of five-yearly carbon budgets, and must prepare policy instruments and proposals for meeting those budgets. The first four carbon budgets will run from 2008-12, 2013-17. 2018-22 and 2023-27 as shown in <Figure 4>. Part 1 also sets out the requirement to develop a system of carbon accounting.



<Figure 4> Progress against carbon budget

Source: UK greenhouse gas emissions statistics and Updated Emissions Projections, DECC

Part 2 of the Act relates to the establishment of an independent non-departmental public body, the Committee on Climate Change (CCC). It gives the CCC duties to advise the Government and devolved administrations on how to reduce emissions over time and across the economy and, on request, on any other matter relating to climate change. This Part of the Act also gives the CCC a reporting function. An annual report must be submitted to Parliament and the

devolved legislatures on the progress that is enabling to meet the objectives in Part 1 of the Act. Part 2 also gives the CCC the authorities from which it needs to implement its advisory and reporting functions, and the Department of Energy and Climate Change (DECC) and the devolved administrations are given authorities to provide financial assistance to the CCC and to issue guidance and directions for the CCC.

Part 3 states the government powers to set up new trading schemes in the UK through secondary legislation. Trading schemes operate by setting caps on total GHG emissions from particular types of activities or sectors, and can limit excessive emitting activities.

The purpose of Part 4 is to provide a clear legislative framework for the UK to drive action on adapting to climate change. It sets out a procedure for assessing the risks of the impact of climate change for the UK, and a requirement on the Government to develop an adaptation programme on matters for which it is responsible. The Act also states that direct other bodies can exercise power to prepare risk analyses and programmes of action, and progress-reporting functions to the CCC.

Part 5, as other provisions, contains various other provisions aim at reporting, measuring and reducing carbon emissions in different sectors of the economy and society. The provisions include powers to establish waste reduction schemes, to introduce charges for single use carrier bags, and to consider requirements for companies to report their emissions.

The purpose of Part 6 is to define the territorial scope of provisions in the Act, set out requirements for making orders or regulations under the Act and define terms used in the Act. For this reason, this part is called as general supplementary provisions.

2) Policy-making process on establishment of the Act

The kick-start for enacting movement for legislation enhancing the emission targets of UK in a legally binding instrument occurred in 2005 and the concept of a climate act became the focus of a major public and political campaign effort. The campaign was initiated and led by Friends of the Earth (FoE) which is NGO on environmental issue. By their effort, in April 2005 three members of parliament (MPs) representing the main political parties took a draft of climate bill into the House of Commons in the UK parliament. Although it received widespread support the Bill was unable to make progress as Parliament was dissolved ahead of the 2005 general election. Shortly after the 2005 general election, a parliamentary motion, also called as early day motion, was opened calling for legislation, in which the bill eventually gained the signatures of 412 MPs from a total of 646.[24)]

In May 2005, FoE publicly launched the Big Ask Network calling for an enactment for the climate bill. With its network of local groups, it organised about 100 public meetings throughout the UK to share the idea of why legal instrument targeting the emission reduction and setting forth the carbon budgets. The meetings involved interested local people and local MPs, and also had discussion on the effect of building grassroots support. The Labour government announced on 15 November 2006 that they would taking the Climate Change Bill.9 David Miliband, then secretary of state for the environment, said: "Friends of the Earth have played a big role in

24) Only three other parliamentary motions, also called as early day motions, had ever been signed by more than 400 MPs. ("October update on the Climate Change Bill". South Hams Friends of the Earth. 12 June 2006. Retrieved 2014-09-28.)

pressing the case for action on climate change. Today's Bill is a big step forward in tackling climate change and we will work with them and many others to make sure it works."[25]

On 13 March 2007 the Department for Environment, Food and Rural Affairs (DEFRA) published the government's draft Bill for public consultation and pre-legislative parliamentary scrutiny. In total there were 16,919 consultation respondents including unique and campaign responses to the public consultation on the draft Bill, which closed on 12 June 2007.

The draft Bill was examined by three parliamentary committees, which held hearings and published reports recommending changes to the draft legislation. In October 2007, the government published its response to the consultation and pre-legislative scrutiny, entitled 'Taking Forward the UK Climate Change Bill' The draft Bill was scrutinized by three parliamentary committees. These Committees received evidence from a series of interested parties between April and July.[26] Through this process at committee level the Bill was eventually introduced to parliament in November 2007.

During the parliamentary debates there were two issues actively discussed in parliament which are the level of the 2050 target and inclusion of GHGs emitted from international aviation and shipment. To provide some evidence enables to solve, CCC which is not given the power and still had being structured published the report that states emission target by 2050 should be 80% against 1990 baseline. Furthermore, NGOs surrounding the FoE kept lobbying to MPs and tried to convey their voice into parliament.

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25) FoE Press release "Friends of the Earth's Big Ask campaign gets Climate Change Bill into Queens Speech"

26) Joint Committee, *Joint Committee on the Draft Climate Change Bill - First Report*, 2007.

When the bill was introduced to the House of Lords by the Government on 14 November 2007.[27] The first debate on the floor of the House (Second Reading)[28] was held on 27 November 2007.[29] After the bill passed to the House of Commons. On 8 June 2008, following the Second Reading, only five members of the House of Commons voted against the bill. After the CCC's advice on emission target for the 2050 was revised from 60% of 1990 carbon dioxide emissions to 80% of the six major GHG emissions. Also, the UK' emission share of international aviation and shipping are included in the target, when a method of measuring these could be agreed.[30] The bill passed into law on 26 November 2008 and it received royal assent on the same date by Queen.

<Figure 5> Draft Climate Change Bill process

Source: Adela Maciejewski Scheer & Corina Hoppner (2010)

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27) House of Lords, *Climate Change [HL] Bill - 2007-08*.
28) A reading of a bill is a debate on the bill held before the general body of a legislature, as opposed to before a committee or other group. In the Westminster system, there are usually several readings of a bill among the stages it passes through before becoming law as an Act of Parliament.
29) House of Lord, *Climate Change Bill [HL] - Second Reading Debate*. 2007.
30) "MPs support tough bill on CO2 reporting". Financial Times. 29 October 2008.

In the UK, the Act was passed with cross-party support and high levels of political engagement. There was also significant mobilization of civil society, led by Friends of the Earth's Big Ask campaign. Also, There were adequate paths to communicate interactively across all the stakeholder including MPs, civil society, and corporation. With this, inter-connected structure of elaborating the bill to the act seems to be observed. The process by which the legislation was initiated and passed in the UK provides a source of practical experience on making climate laws at a national level.

3) Climate Change Act and beyond

UK has become a pacesetting country in climate change and achieved the emission target for first carbon budget period which was designed from 2008 to 2012. The net carbon account that UK showed in 2013 is 2,982 MtCO2e compared to the legislated budget of 3,018 MtCO2e. This amount of emission in 2013 were 28% below against its 1990 level.[31] Also, total GHGs emission have been provisionally estimated at 550.8 MtCO2e over the four quarters to Quarter1, 2014 with a decrease of 18.9 MtCO2e compared to the year up to quarter 4, 2013 when emission was estimated at 569.6 MtCO2e.. And percentage of decrease among two quarters is 3.3%.

According to progress report 2014 published by CCC, this is due to good progress implementing some policies such as support for improved fuel efficiency of new cars, investment in wind generation, and Electricity Market Reform, one of the most notable policies. And most contributed sector for emission reduction in 2014 were energy supply and residential sector which are decreased by 4.8 and 9.9 per cent respectively from quarter 4 of 2013 to quarter 1 of 2014.

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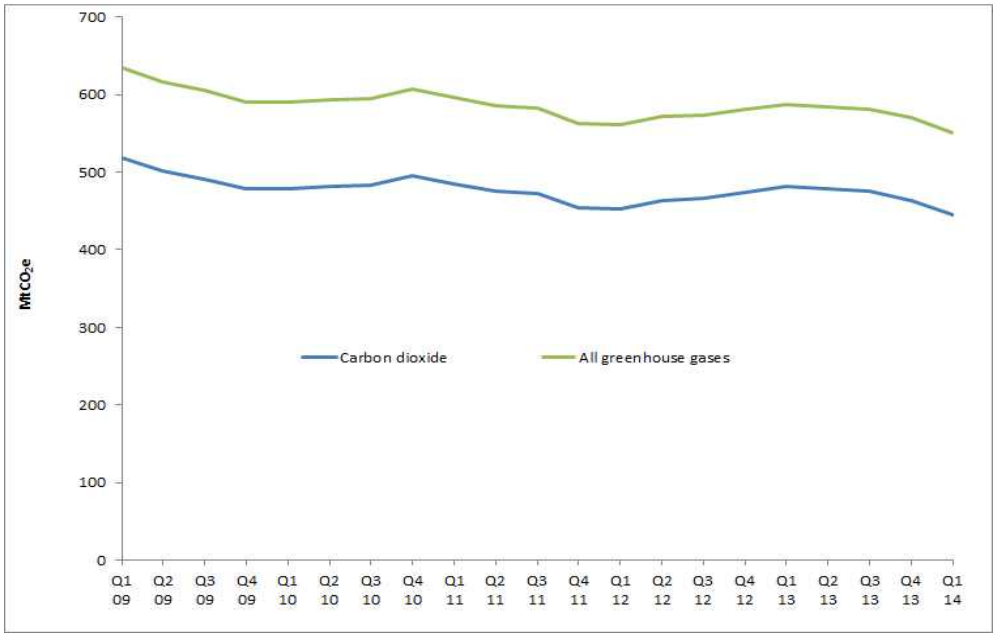
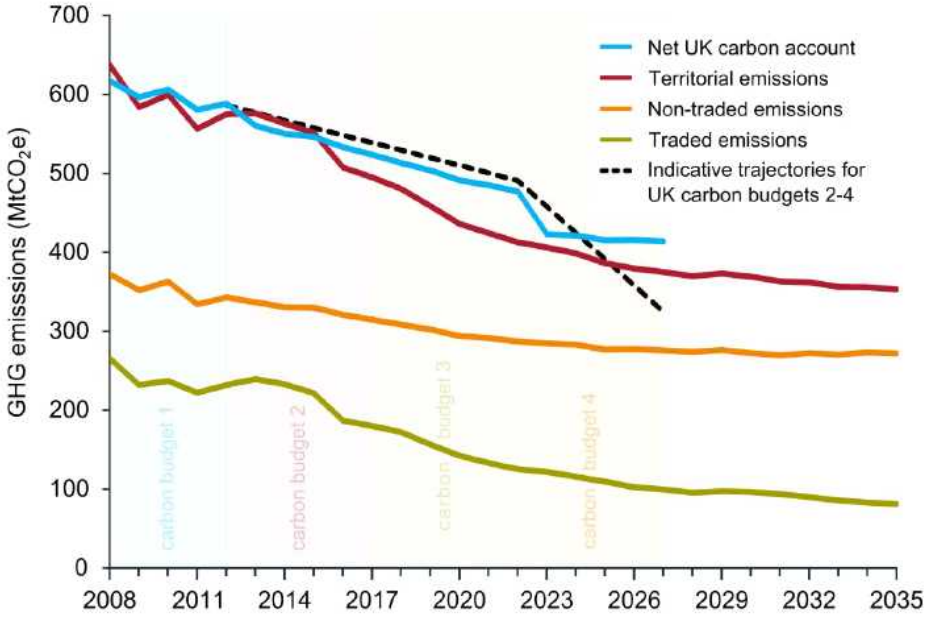
31) Committee on Climate Change, *Fourth Carbon Budget Review*, 2013



<Figure 6> Actual emissions of all GHGs and carbon dioxide (Quarter 1 2009 - Quarter 1 2014)

Source: "UK Greenhouse Gas Emissions - 1st Quarter 2014 Provisonal Figures", DECC, September 2014

While the progress moving onward to long-term target to reduce the GHGs emission, further action for the carbon budget has been made. The fourth carbon budget (2023-27) was legislated in 2011 commits the UK to reduce GHGs emissions by setting at 1,950 MtCO2e, also measured by 50% from 1990 to 2025. This amount of reduction target is much higher than recommendation by European Commission (EC) in which proposed target set as 40% in 2030 on 1990 levels. As the fourth carbon budget were set, The projected UK emissions of GHGs in the light of carbon account and budget is like as follows.



<Figure 7> Projected UK emissions of GHGs against targets[32)]

Source: "Updated energy and emissions projections 2014", DECC, September 2014

Note:

1. Net UK carbon account is calculated by adding the traded sector cap to actual non-traded emissions.
2. Territorial emissions is the emission physically produced in the UK
3. Non-traded emissions encompass those from: fuel combustion by the residential sector; the majority of fuel combustion in the commercial, public services and agricultures sectors; combustion for traction in the transport sector; combustion by smaller boilers and engines in the industrial sector
4. Traded emissions include those from: combustion by energy industries; process emissions from some industries (e.g. iron and steel, cement, glass); and fuel combustion in large boiler/CHP installations by industry and, to a lesser extent, by the service sector and agriculture

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32) "These projections are subject to uncertainty. Modelling of the impact of uncertainty in key assumptions shows that carbon budgets two and three lie above the 95% confidence intervals for net carbon emissions." ("Updated energy and emissions projections 2014", DECC ; p. 8)

Based on this figure, the UK has met its first carbon budget as pointed out previously. And projections described above indicate that the UK is likely to meet its carbon budget for second and third periods but further policy effort would be required to meet the emission target set in the fourth period.

Through the review of the act, there was strong evidence showing the reduced GHGs emissions for past 6 years in UK since the act had been established in 2008. Because the ultimate goal is to meet the target of emission reduction by 2050 set in the act, it would be too soon to evaluate if the act is successful or not. To change this uncertainty to confidence, UK government is pushing ahead with policies on climate change through driving forces which are DECC and CCC. Furthermore. parliament, NGO and even corporation are taking their positions with supporting the aggressive target to reduce GHGs emissions.

This is indeed unusual phenomenon because aggressive emission target that leads to related policy and regulation would cause serious hindrance against economic growth. For this reason, this study will scrutinize the factors revealed in the process on establishment of the Climate Change Act 2008 with employing the combine model of Policy Network Analysis with Social Network Analysis.

IV. Network Analysis on Establishment of Climate Change Act

1. Policy Network Analysis by periods

1) The period of policy-suggestion

(1) Which one was the main actor?

In this period there are 23 actors appeared and this includes 10 actors from government/parliament (GP), 11 actors from non-government (NG) and 2 actors from Business/Industry sector (BI).

<Table 9> Centrality of Actor in period of Policy-suggestion

Actor	Type	Degree Centrality (%)			Between Centrality	Eigenvector Centrality
		Symmetric	Out-degree	In-degree		
Government	GP	17.8	3.0	17.8	80.8	0.548
Conservative Party	GP	12.5	11.7	7.6	64.0	0.490
Friends of the Earth	NG	12.5	12.5	5.7	60.4	0.501
Tony Blair	GP	12.5	2.7	10.6	31.1	0.207
Stop Climate Change	NG	10.6	5.7	6.5	55.2	0.062
LD Party	GP	8.3	6.4	5.3	9.3	0.334
Stern (Report)	NG	8.3	4.2	6.8	107.5	0.112
DEFRA	GP	6.8	5.3	3.4	41.7	0.133
Institute	NG	3.8	3.8	0.4	0	0.024
Labour Party	GP	3.4	0.8	3.4	0	0.047
Green Party	GP	2.7	2.7	0.4	1.5	0.024
Green Peace	NG	2.3	2.3	0.4	0.5	0.005
WWF-UK	NG	2.3	1.9	0.4	1.3	0
Business & Industry	BI	1.9	1.9	0.4	0.6	0.105
Celebrity	NG	1.9	1.9	0.8	0	0.015
Radio Head	NG	1.9	1.9	1.1	0	0.072
Gordon Brown	GP	1.5	0.8	1.5	0	0.016
Oxfam	NG	1.1	1.1	0	0	0
CBI	BI	0.8	0.8	0	0	0
Royal Society	NG	0.4	0.4	0	0	0
DTI	GP	0.4	0.4	0	0	0
DT	GP	0.4	0.4	0	0	0
Anti-NC	NG	0.4	0.4	0.4	0	0.026

The actor that shows the highest degree centrality is government. And conservative party, Fiends of the Earth (FoE), Tony Blair, Stop Climate Chaos (SCC), Liberal Democrat (LD) party, and Stern are recognized as key actors in suggesting the policy to government. It's not questionable result that government and parliament are considered as main actor. However, the fact that FoE, SSC and Stern were another key actors is remarkable phenomenon. And it's clearly revealed how FoE could be a key actor if we move on to out-degree centrality. The two most important actors affecting to the other actors are FoE and conservative party. And LD party, Department of Environment, Food, and Rural Affair (DEFRA), and SCC were followed after them. Although the FoE is environmental NGO, it aggressively takes lead in suggesting the policy to government by launching 'Big Ask Campaign' in the beginning of this period. SCC, coalition of NGO for climate change, also initiates their own campaign such as climate change march and participating the FoE's campaign as well.

Another side of strong group to give pressure to government was cross-party of MPs including conservative, LD, and green party. David Cameron, current prime minister of UK in 2014, insists his strong concern for climate change as leader of Conservative Party and convey the voice from MPs to Tony Blair or government. Above this, David Miliband, secretary of DEFRA, expressed the need of strong climate change instrument. And including Stern, Institute makes their position on climate change for more tight and stringent policy. In case of In-degree centrality, Tony blair and government received the most influence by the other actors as it's assumed easily because they have authority for policy-change and are policy-implementing actors. And conservative party, Stern, SCC, and

FoE are influenced constantly by each others. In short, except government and ruling party, NGO and MPs are reaching to united front by building coalition and cross party beforehand.

Between centrality identify that which actors playing a role to bridge the gap. According to the result, Stern and his report is the most important intermediate actor in suggesting the climate change bill. It means that the other actors recognize the Stern and his report is the accountable and important in climate change policy and also the report and Stern make an impact on the other actors to change their thought in process of policy suggestion. Apparently Stern report provides the substantive evidence and warn with economical prediction in climate change. Through this report, the frequency and depth of discussion among actors on climate change which is invisible and intangible had been increased and continued more specifically.[33)]

The actor who is in relation with the most important and influential actors turns out to be FoE. In the indicator of Eigenvector centrality, Government and MPs have the strong relationship evidently due to short distance and nature of policy-decision. However, FoE shows the second highest centrality which means not only it has high-connectivity and strong relationship with key actors but also it approaches to right actors and suggests their opinion efficiently.

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33) At the launch of Sir Nicholas Stern's review on tackling global warming on 30th October 2006, Tony Blair, the prime minister, said there was "overwhelming scientific evidence" that climate change was taking place and that the consequences of failing to act would be "disastrous" And Professor Michael Grubb, a professor at Cambridge University said: "The Stern Review finally closes a chasm that has existed for 15 years between the precautionary concerns of scientists, and the cost-benefit views of many economists.

(2) Interaction among the actors

① Initiative from NGO

In early 2005, FoE decided to launch the Big Ask campaign for new legislation that would require the government to cut emissions every year by three per cent[34]. After discussions between FoE, John Gummer (former conservative environment minister), Michael Meacher (former labour environment minister) and Norman Baker (Liberal Democrat environment spokesman), a presentation of climate change bill is introduced to parliament, setting out the bill to combat climate change by establishing annual targets for the reduction of carbon dioxide emissions until 2050. However, further debate and vote haven't been conducted because parliament is shortly dissolved ahead of the general election of UK in 2005. The following history of the campaign is described in table.

<Table 10> History of campaign organized by FoE

Timeline	Event	Partner
25 May 05	FoE launch the Big Ask climate campaign AND Early day motion opened	Radiohead
13 Jul 05	A coalition of groups, MPs and FoE called for new law to MPs.	NGO, MPs
29 Jul 05	Letter to Government	NGO,MPs, Business
01 Mar 06	'Carbon Speed Dating' with Stop Climate Chaos	MPs, NGO
01 May 06	Big Ask concert in London	Artists, MPs

34) According to press release of FoE, they decide to lauch the campaign due to failure of government efforts to tackle climate change. Despite two manifesto pledges to cut carbon dioxide emissions by 20 per cent (of 1990 levels) by 2010, and commitments for a 60% cut by 2050, since 2003 emissions have actually been higher than when Labour came to power in 1997.

01 Sep 06	Conservative leader and FoE shared idea	MPs
15 Sep 06	FoE launches big push on climate change bill	MPs
23 Oct 06	FoE analysis of energy is published	Institutes
4 Nov 06	Support to Stop Climate Chaos marching event	NGOs
15 Nov 06	Climate change bill is introduced	

Since FoE has launched the Big Ask campaign in May, 2005, the actors involving in effort to push the government was increased. In May, an Early Day Motion (EDM)[35] was put down in parliament calling on the government to commit to secure legislative commitment to a 3% annual reduction in carbon dioxide emission. FoE had campaigned to make people write and lobby to their MPs so that they can support the EDM for climate change bill. In July, A coalition of groups and MPs coordinated by FoE launched details of the proposed new law to MPs and they sent the letter that calls on government to legislate climate change bill.[36] At this time, many of NGOs starts to be involved such as 'Christian Aid' and 'WWF-UK' into the coalition. Eventually, Stop Climate Chaos is formed in September, 2005 and it includes NGOs more than forty.[37] Also, Radio head and Jonny Greenwood play at the Big Ask concert in support of

35) An early day motion (EDM) in UK is a motion, expressed as a single sentence tabled by Members of Parliament that formally calls for debate "on an early day". In practice, they are rarely debated in the House and their main purpose is to draw attention to particular subjects of interest. Eventually EDM calling for climate change bill was signed by 412 oth the 646 MPs. Only three other early day motions had ever been signed by more than 400 MPs in the history of UK.

36) In their letter, the 13 UK companies also called for a climate change policy that would create greater certainty about the long-term value of emission reductions. They urged the government to set targets for emissions trading and other related policies beyond 2012.

37) Stop Climate Chaos ran 'The I Count campaign' aimed to ensure that world leaders act on rising global greenhouse gas emissions in order to keep average global temperature increase to under 2° C and so avoiding the more serious consequences of global warming.

the FoE. And David Cameron, leader of conservative party, and David Miliband, soon-to-be Environmental Secretary, were ones of crowd for the concert.

In the period of policy suggestion, the most remarkable phenomenon is the coalition of NGOs and FoE's aggressive will. Although FoE was revealed as a key actor among NGOs, the other pillar, Stop Climate Chaos, also support to FoE and run their own event such as climate change march to call action in November. It was attended by 20,000 to 25,000 people and held in London, calling on the government to take more serious action to prevent damage from climate change. With strong network within NGO. Besides, Tony Juniper, director of FoE, and David Cameron shared platform to call for a climate change bill te be included in the upcoming Queen's speech.

② Taking the lead of Conservative party and coalition of MPs

According to Nick Boles, and adviser to David Cameron since conservative party had lost in the general election in 2005, David Cameron started to use climate change as an issue to decontaminate the Conservative brand. And the need to persuade Liberal Democrat voters at the 2006 local elections also played its part in motivating the Conservative party's change of position.[38] From the spring of 2006, Cameron began his policy of 'greening' the Conservative Party and changed the official slogan to "Vote Blue, Go Green." His firm concern is indicated in his speech.

> "Today, I want to tell the British people some uncomfortable truths. There is a price for progress in tackling climate change. Yes of course low-energy light bulbs, hybrid

38) the interview is adopted by report of institute for government

cars - even a windmill on your roof can make a difference and also save money. But these things are not enough. Government must show leadership by setting the right framework. Binding targets for carbon reduction, year on year. ..... We have asked Tony Blair to put a climate change bill in the Queen's speech. If he does, we'll back it. So come on, prime minister. It's your last few months in office. It's your last Queen's speech. Use it to do something for the environment."[39]

Following shift of Conservative's stance, Liberal Democrat, have insisted tough target on emission reduction, and Conservative party becomes alliance for climate change bill. As a result, cross-party has been formed between major opposition party and green party as well. They take a slightly different stand on climate change bill but certainly agreed legal framework to reduce GHGs emission.

<Table 11> Stance of major parties on climate change policy

	Conservative	Liberal Democrat	Green
Emission Reduction	Committed to the bill to impose binding annual carbon emission targets	Committed to Kyoto target of a 20 per cent cut in the UK's CO2 emissions	Committed to 20 per cent cut in CO2 by 2010
Nuclear energy	Undecided on future of the new nuclear power generation	Willingness to cancel new nuclear power programme.	Close nuclear programme
ETC	Bill would create an independent climate change commission		Increase energy from renewable resources by 40 per cent by 2020

39) Quoted speech is made in Conservative conference on 4th October 2006

Although Specific aim on target of emission reduction and nuclear energy policy is not exactly agreed, the most of MPs in opposition party agreed to legislate the climate change bill. The leader of Liberal Democrat and a variety of MPs conveyed their opinion to Tony Blair[40] and David Cameron urged his strong stand to prime minister in various manners such as media interview[41], speech in conference or meeting, writing letter, and face to face talk.

Through the consolidated stance on climate change bill, David Cameron gave the rough pressure to Tony Blair. As David Miliband, the environment secretary, admitted he was scared about the growing threat of climate change and signalized the bill regulating emissions with legally-binding manner would be set in mid of October, David Cameron asked if the bill would be included in the Queen's speech in November at commons question time. But, Tony Blair said he would not comment on the content of the government's legislative plans with avoiding straight answer.

In short, well-functioned cross-party of MPs is able to gather their voice efficiently and demand clear opinion to prime minister and government. Also, strong voice and action from leader of Conservative played a leading role in discussion that urges the legally-binding target on emission. Finally, David Miliband admitted the need of urgent and tough binding emission target and started to

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40) "Sir, We call on the Government to introduce a climate change law in the forthcoming session of parliament. Such law, which has already won the support of most MPs and is backed by groups as diverse as Friends of the Earth, Help the Aged and the Women's Institute, would commit the UK to cut its CO2 emissions year on year." (Petition made in 28th October 2006)

41) "Well what we, and Greenpeace and Friends of the Earth agree about is that we should have a Climate Change Bill. We need an organisation in that Bill to monitor climate change and to set annual limits and then to judge the government's performance against that." (In the interview on politics show, 29th October 2006)

express his concern and willingness on climate change bill.

③ Stern's review and Labour's announcement

On 30th October 2006 at the Royal Society, The Stern's review on the Economics of Climate Change by Nicolas Stern is launched. At the same time, Gordon Brown, the Chancellor of Treasury, finally confirmed that the Government will table a climate change bill in next month's Queen's Speech, which will commit it in law to its target of cutting the UK's CO2 emissions by 60% by 2050. All the comment on the report is fully welcomed from every actors. Tony Blair said that "this is the most important report on the future published by this government[42] in its time in office." Also he added that "What is not in doubt is that the scientific evidence of global warming caused by greenhouse gas emissions is now overwhelming".

However, the voice concerning on the climate change bill persists. Because David Miliband and Tony Blair was hesitating to have the binding target and they wanted to set for five-yearly target. Accordingly environmental groups and MPs from all parties strongly expressed their regret and demand binding target with annual base to the government on the forthcoming climate change bill. Although Tony Blair expressed his concern on economic depression[43], this excuse were dismissed by environmental group. MPs warned about binding and term of target issues. Green Party said "Almost two-thirds of MPs have called for annual binding targets, reflecting the British public's desire for urgent action to tackle devastating

42) The Stern report is commissioned by UK Treasury.
43) Tony Blair said "there would be problems with setting annual targets for reducing emissions, because of the way the economic cycle worked and variations in the weather from year-to-year"

carbon emissions." with describing the government's proposal as "toothless". Liberal Democrat said "We need a government that proposes solutions, not just targets. If targets alone solved problems, this would be the best-governed country in the world." with sarcastic tone. Conservative party suggested that need for rolling annual carbon reduction targets[44] to be agreed in Parliament; an independent body to assess the science and make recommendations as that evolves; and an annual report to Parliament to ensure ministers and civil servants are accountable. Against this opinion, David Miliband mentioned that both of binding and rolling target is not possible and he urged to engage in a serious debate and stop gesture politics to David Cameron.

(3) Linkage structure

<Table 12> Indicator for structure in period of Policy-suggestion

Density (%)	Degree Centrality(%)[45]	Centralization (%)	Geodesic Distances
17.2	14.5	39.0	2.1

In this period, all the results of features related with structure is low. Per cent of density is 17.2% and it means that the number of tie is connected around 17% among potentially possible ties. Therefore it indicates interaction of actors did not occur in multi-dimentional way. In terms of centrality and centralization, the per cent is low which means the policy network interacts more openly not centralized. The feature of Geodesic Distances is 2.1 and it indicates that immediacy and efficiency are high. Because the feature

44) Rolling emission target means the target would be modified based with condition of economy or climate change.
45) Degree Centrality represent the mean of degree centrality

means the average number of steps is 2.1 to get to each actors. For instance, anyone can have interaction with Government or Parliament via FoE. In short, the network did not embrace all the actors. But. it is decentralized not closed and its reachability to each other is prompt and efficient.

(4) Synthesis of the period

The most remarkable feature occurred in this period can be described as coalition and will of leader. The coalition of NGO is led by FoE and 'Stop Climate Chaos'. And FoE played their own role aggressively in terms of gathering the public opinion and delivering it to Government and MPs. The same feature is shown on MPs side. A leader of Conservative party made strong voice toward Government and Prime Minister. Liberal Democrat, the second major opposition party, supported Conservative party and it led to coalition of opposition party in MPs. After coalition in different sector, the leader of each sector had interaction via letter, speech, report and face to face.

Stern and his report are the other catalyst to take the discussion of the bill forward. Through his report, actors were able to share and arrange their opinion by providing scientific and economic evidence on climate change. And recognition of David Miliband, secretary of environment on climate change also made an impact on interaction in the policy network. Business sector agreed the binding and long-term target in emission reduction because climate change is inevitable issue in UK.[46] Eventually, the only actors object to have binding emission target are Tony Blair and government.

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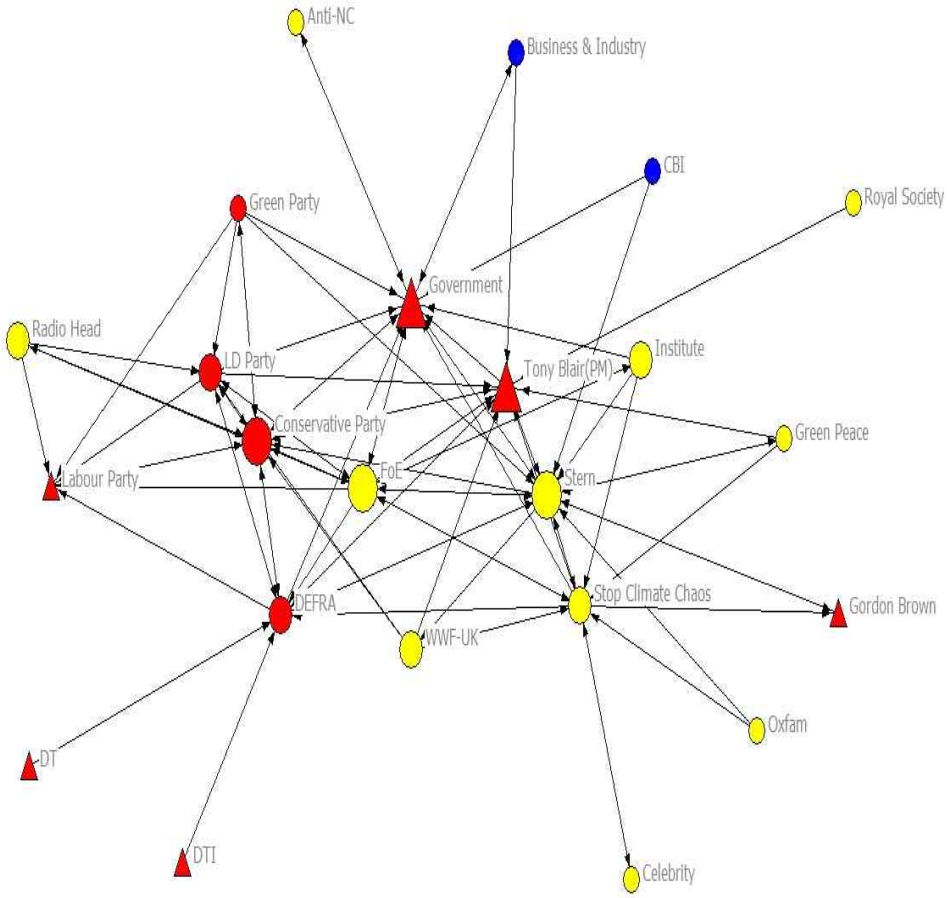
46) The CBI director general Richard Lambert said a global system of emissions trading was now urgently needed as a "nucleus" for effective action. "Provided we act with sufficient speed, we will not have to make a choice between averting climate change and promoting growth and investment." interviewed at Stern's review launching event on 30th October 2006



<Figure 8> Sociogram in period of Policy-suggestion

Note: In sociogram, red color represents Government/Parliament sector and yellow color represents civil society and blue color represents Business/Industry. Regarding to figure, Circle means that actors who ask for climate change bill and Triangle means that actors who agree with emission reduction but does not ask for the bill. And size of figure represents the extent that actor is connected and related to the others.

Above sociogram shown in <Figure 8> indicates the actors, interaction and structure in overall. The most influential and important actors are identified as Conservative Party, Government, Tony Blair, FoE and Stern. The reason why FoE placed in central is that this actor had interaction with diverse actors and related with MPs closely. So FoE is dragged to left-side despite it is classified as NGO.

In terms of Interaction, frequency was not high but exchange of opinion happened relatively well due to coalition within sector and leader of each coalition. Interaction way of opinion sharing made through interview, media, speech, event, and face to face. Interesting case that we can regard this network structure open is MP and official's visit in concert. David Cameron and David Miliband was one of the crowd at concert of Radiohead and it could be considered one of the interaction way between public, MPs and official. And the key issue of interaction in this period was the need of legally-binding target on emission.

2) The period of policy discussion

(1) Which one was the main actor?

In this period there are 36 actors appeared and this includes 14 actors from government/parliament (GP), 18 actors from non-government (NG) and 4 actors from Business/Industry (BI) sector.

<Table 13> Centrality of Actor in period of Policy-discussion

Actor	Type	Degree Centrality (%)			Between Centrality	Eigen vector Centrality
		Symmetric	Out-degree	In-degree		
Government	GP	24	0.9	24	96.6	0.244
DEFRA	GP	11.4	6.3	9.4	244.6	0.398
Gordon Brown	GP	10.6	9.1	8.0	296.9	0.557
Conservative Party	GP	10.0	7.1	6.9	146.9	0.482
Tony Blair	GP	8.6	4.6	8.3	142.5	0.454
Friends of the Earth	NG	7.7	5.7	2.9	82.8	0.108
LD Party	GP	6.3	5.1	1.1	7.2	0.000
Labour Party	GP	3.4	1.1	2.6	12.3	0.032
Joint Committee	GP	3.4	3.4	0.6	10.5	0.006
Green Party	GP	3.1	2.6	0.6	3.2	0.000
Aviation	BI	3.1	2.0	1.7	60.1	0.082
Stop Climate Change	NG	2.9	2.6	1.1	33.3	0.054
WWF-UK	NG	2.9	2.6	0.9	11.6	0.023
CEAC	GP	2.9	2.6	0.6	2.8	0.000
Christian Aid	NG	2.9	2.9	0	0	0.000
Institute	NG	2.6	2.0	0.9	33.9	0.001
Celebrity	NG	2.3	2.3	0	0	0.000
EAC	GP	2.0	2.0	0.3	0	0.026
Stern(Report)	NG	1.7	0.6	1.1	21.0	0.000
Business & Industry	BI	1.7	0.6	1.7	0.3	0.093
CCA	NG	1.7	0.9	0.9	30.7	0.000
Green Alliance	NG	1.4	1.4	0.3	4.9	0.032
Al Gore	NG	1.4	1.4	0	0	0.000
MPH	NG	1.1	0.3	1.1	0	0.003
Green Peace	NG	1.1	0.9	0.3	0	0.000
CBI	BI	0.9	0.9	0	0	0.000
Quality of Life	GP	0.9	0.6	0.3	0	0.000

European Union	NG	0.6	0.6	0	0	0.000
ABI	BI	0.6	0.6	0	0	0.000
Mayor of London	GP	0.6	0.6	0	0	0.000
Radio Head	NG	0.3	0.3	0	0	0.000
DTI	GP	0.3	0.3	0.3	0	0.023
Oxfam	NG	0.3	0.3	0	0	0.000
LAQN	NG	0.3	0.3	0	0	0.000
Royal Society	NG	0.3	0.3	0	0	0.000
I Count	NG	0.3	0.3	0	0	0.000

The most important key actor is identified as Government. And there were DEFRA, Gordon Brown, Conservative party, Tony Blair, FoE and Liberal Democrat party in order of importance. Except FoE, rest of the actors recognized as the important actor who interacts actively were on Government and MPs side because the government and MPs had taken a leading role in drawing up the bill. And Gordon Brown, former Chancellor of Treasury, had emerged as main actor in policy network on the climate change bill as he became Prime Minister after Tony Blair.

The most influential actors on the other actors are Gordon Brown, Conservative Party, DEFRA, FoE, Liberal Democrat Party and Tony Blair in order of importance. Through Conservative Party, David Cameron pressed ruling party and government consistently and FoE did not stop to raise their voice. The highest per cent of 'In-degree centrality' is shown from Government because the government was key authoritative actor in this period. Including Conservative Party, Most of the MPs and Government actors are spotted as main actors by other actors. The reason that FoE does not get much pointed out is that their role is not drawing up the bill.

As assumed, government and Prime Minister are considered as

main actor in the indicator of 'betweenness centrality' However, FoE is still considered as main actor and broker by delivering the opinion from public to authoritative level. And remarkable phenomenon in this period was emergence of Aviation sector. While making the bill, it was sensitive issue whether CO2 emitted from aviation and shipping should be included in emission target or not. And besides 'Stop Climate Chaos', Institute and Campaign for Clean Air are identified as broker as they placed in middle of interaction between Government and public by researching and proposing their opinion on the bill.

In terms of 'Eigenvector centrality' FoE was the key actor who interacted with main actors which are government and MPs. In this period, actors who have actual authority to write and modify the bill such as government and MPs are supposed to be key actors. Therefore, numerical value of eigenvector centrality of high-level actors is meaningless.

Compared with previous period, there are 13 more actors appeared in this period. 3 committees from parliament and government entered in the network for the climate change bill. And actors outside of UK have a slight influence on the actors such as Al Gore and European Union.

(2) Interaction among the actors

① After Labour's announcement on climate change bill

As government starts to draw up the bill, MPs and NGOs strongly insists that tough target in long-term and independent body to set up the target and monitor the progress. David Cameron set up the 'Quality of life policy' group in last year to research on climate

impact and publish the report. And he calls for binding annual targets for cuts in emissions and said that carbon target should be cut 'at least 60 per cent' by 2050. In the beginning of 2007, David Miliband mentioned the bill will outline a long-term framework to reduce emissions and put into statute the target of a 60% reduction in CO2 emissions by 2050. Against his notice, FoE rounds on him with saying that the target showed the government was still failing to tackle climate change, with carbon dioxide emissions still higher than when Labour came to power in 1997. And Conservative Party supports FoE's opinion and they firmly believed that the goal of a 60 per cent reduction in emissions by 2050 is likely to be proved inadequate according to their policy research group and insisted the target should be 80 per cent by 2050. As Liberal Democrat Party also agreed Conservative's opinion, solid coalition persisted.

On 13th October 2007 government launched the draft of climate change bill and the key points of the bill are classified in 4 categories. Firstly, the bill set out the legally binding targets to reduce carbon dioxide emissions by 60 per cent by 2050 and by up to 32 per cent by 2020. Secondly, legally binding "carbon budgets" will be set at least 15 years ahead and new statutory body, the Committee on Climate Change, will provide independent expert advice to government on achieving targets. Thirdly, New powers to enable the government to more easily implement policies to cut emissions. Fourthly, A new system of annual open and transparent reporting to parliament by the Committee on Climate Change.

As the draft of bill came out and the issue of climate change bill was increasingly emerging in UK, the MPs argued each other to prove that own party is more greener than the other.[47] In the eve of

47) Liberal Democrat Leader said "the Conservatives may back the climate change billl but they have failed to tell the count how they will reduce

the draft is published, both of David Cameron and Gordon Brown made speech on global warming and climate change bill and submitted proposal for green plan. Although both of political leaders agreed with serious impact of climate change, the conflict in emission target did not close to each other. And the bill represents a rejection of calls by both the Conservatives and the Liberal Democrats and environmental groups for binding annual target emission levels. David Miliband said that varying weather conditions made that impractical.

Outside MPs, most of the actors welcomed the draft but they urged more ambitious target to government and Gordon Brown. However Confederation of British Industry (CBI) did not show their opinion on specific emission target. And they launched CBI's climate change task force and met for the first time to collect opinion from business side. Aviation sector is one of the sensitive actor in terms of emission target and they expressed concern that burdensome would occur from passenger side.

② Public consultation on the bill

Prior to finalizing the Bill, public consultation on the bill ran through to 12 June 2007 by DEFRA. the Government requested feedback from all interested parties in order that they have the opportunity to contribute their opinions at an early stage of policy development. The consultation document asked important questions about the shape of the policy proposals and what issues the Government should take into account, when developing the Climate Change Bill. In total there were 16,919 consultation respondents; this comprised 1,197 sector responses and a total of 15,722 campaign based responses.

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carbon emissions. They are all targets and no teeth. We are the only party to have put forward substantial proposals about the environment."

<Table 14> Number of respondents in public consultation[48)]

Sector	Number of respondents	Campaign	Number of respondents
Trade association	45	RSPB	4,746
Public sector	125	Stop Climate Chaos / Take Action Now!	3,996
NGOs	195	Friends of the Earth	3,589
Industrial / business	77	World Development Movement	2,919
Individual	687	Credition Climate Action	145
Energy supply industry	34	Christian Aid	133
Academic / research	34	Tearfund	129
		GCI	50
		People and Planet	15
Total	**1,197**	**Total**	**15,722**

Source: DEFRA (2007)

According to report of public consultation by DEFRA, NGOs were strongly represented on including emissions from aviation and shipping in the UK's target and making carbon budgets annually. Public sector were slightly under-represented on including emissions from aviation and shipping. Industrial/Business sector were under-represented on including emissions from aviation and shipping in the UK's target and making carbon budgets annually. In terms of the Committee having an advisory function, most of the sectors and campaign agreed that the Committee should have a role that was more than just analytical or advisory. And 95% of the respondents either agreed with the current proposed legal target for reducing CO2 emission by 60% by 2050 and a further interim legal target for 2020

48) RSPB: Royal Society for the Protection of Birds, GCI: Global Common Institute,

of 26-32% in full or subject to qualification.[49] In terms of target on emission, RSPB, Stop Climate Chaos and Friends of the Earth proposed an 80% target reduction by 2050, whilst the World Development Movement proposed target reductions of 85% to 90%. The well-organized public consultation made interaction of actors actively and more open. With this event, NGOs, Industry/Business sectors and Individual who are not able to participate in discussion of developing law could have influence on Government.

③ Pre-legislative scrutiny on the bill

And there was another remarkable interaction in parliament after the draft of the bill is published on 13 March 2007 by DEFRA. The draft of bill was scrutinized by three parliamentary committees. A Joint Select Committee of 24 members from the House of Lords and the House of Commons, chaired by Lord Puttnam, was immediately established to scrutinize the Bill. The Environment, Food and Rural Affairs Select Committee of the House of Commons also carried out its own inquiry into the draft Bill, as did the Environmental Audit Committee. These Committees received evidence from a series of interested parties between April and July 2007.

The Environmental Audit Committee called for a climate change and energy secretariat, based in the cabinet office, to lead the government's climate policy and solve inter-departmental conflict. MPs also supported the creation of a cross-departmental climate change and energy minister who could attend cabinet assemble. A Joint Select Committee argued that annual carbon budgets should be set and policed through greater parliamentary accountability as well

49) 11% of respondents agreed in full and 84% of respondents agreed subject to qualification with the proposal.

as being legally enforceable in the report on the draft climate change bill, while welcoming the proposed legislation. And they questioned the adequacy of the target of 60% reduction by 2050, and also said that aviation and shipping emissions should be included in the UK.

Unveiled interaction of three committees was not progressed actively with the other actors but it was significant stage to provide platform among MPs and government to have further discussion on the bill. However the public consultation was the remarkable bridge to connect authority and public level. After receiving the result of consultation, Gordon Brown asked the Committee on Climate Change to report on whether the 60% reduction in emissions by 2050 should be higher.[50] Including FoE, WWF-UK and Stop Climate Chaos, NGOs were able to share their own idea and stance on climate change bill with Government.

At this time, the most controversial issues on the bill were emission target by 2050, creation of new department for climate change and energy, and cycle of carbon budget. Except Government, Labour Party and Business sector, rest of the actors urged higher target in emission and framework for binding implementation. And actors who urged the toughest emission target were Green party and Tyndall Institute as they proposed 90% cut by 2050.

Although Government tried to show gesture to reflect the public opinion by convening the consultation, evidence of bilateral interaction is not found. NGOs kept sending their voice to government and

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50) Gordon Brown tells the Labour party conference in Bournemouth in September 2007: "I am proud that Britain will now become the first country in the world to write into law binding limits on carbon emissions. But I am not satisfied: so I am asking the new independent climate change committee to report on whether the 60% reduction in emissions by 2050, which is already bigger than most other countries, should be even stronger still."

parliament. But, authoritative level did not show influential response until October 2007. Also, There was no actual interaction between three committees on climate change who participated in pre-legislative scrutiny and the other actors.

In October DEFRA published the respond to the other actors with the report named "Taking Forward the UK Climate Change Bill: The Government Response to Pre-Legislative Scrutiny and Public Consultation". And the draft of climate change bill is delivered to Parliament for legislative process.

(3) Linkage structure

<Table 15> Indicator for structure in period of Policy-discussion

Density (%)	Degree Centrality(%)	Centralization (%)	Geodesic Distances
10.7	21.7	62.4	2.4

In this period, per cent of density is 10.7% which is lower than previous period. It implies that the number of actor is increased than before and also ties among actors loosely connected. In terms of degree centrality and centralization, both of indicators are increased than previous period. Especially, centralization looks remarkable. It means that discussion and drawing up the bill has been made within central level. Geodesic distance is increased as well. It indicates that distance among actors is farther than previous period.

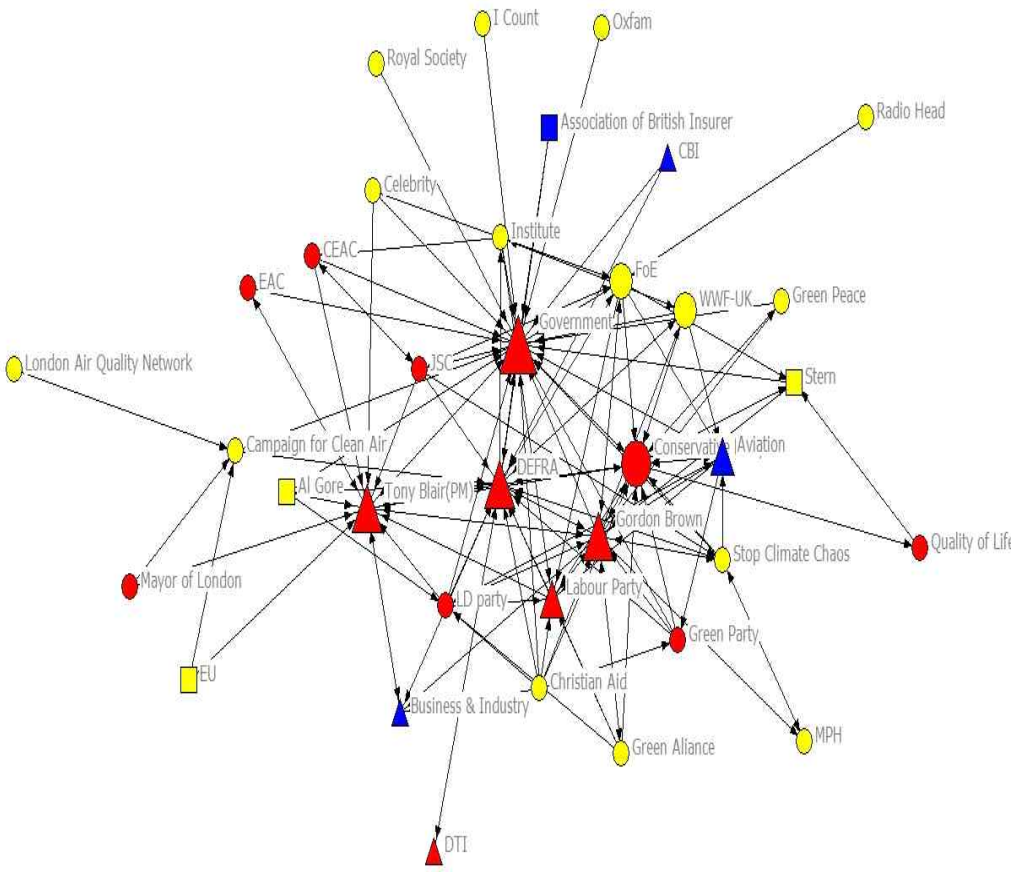
In short, size of the network expanded as actors are increased. But, close interaction occurred only at the central level so actors placed in periphery side could not reach to core actors efficiently and faster by comparison with previous period.

(4) Synthesis of the period

After announcement that Labour Party decided to adopt the climate change bill, key issue of discussion shifted to how UK reduce the CO2 emission from whether they should reduce or not. As Tony Blair's tenure almost finished, Gordon Brown, Chancellor of Treasury and the next likeliest prime minister, and David Cameron, leader of Conservative Party, had conflicting interaction in various way including letter, report, speech and face to face. Furthermore, they ran the race to be environmental friendly party more than each other. The coalition had been formed from previous period continued to this period. Main NGO groups such as FoE, WWF-UK and Stop Climate Chaos consistently gave pressure to government and MPs by urging more ambitious emission target. With appearance of draft of the bill, key issues were identified as target in emission reduction, timeline of the emission reduction, counting emission from aviation/shipping and level of authority of independent body.

Another main interactions in the period were public consultation on the bill and pre-legislative scrutiny conducted by Government and Parliament respectively. According to the result of the consultation published by Government, the opinion of NGOs was well consolidated than other actors and kept claiming that 80% of emission target is essential to achieve UK's emission reduction; annual carbon budget should be set out; emission from aviation and shipping should be included in carbon budget; and role of independent body need to be powerful enough to set the budget and monitor the implementation rather than just advisory and analytical. And Business/Industry sector warned excessive emission reduction would cause economic depression, whilst they agree with adopting legal framework on

climate change. In terms of pre-legislative scrutiny, three committees were formed by both of House of Commons and House of Lords and member of one of the committees are selected by DEFRA. These committees did not mention the specific emission target numerically, they reached the same opinion that 60% of target in emission reduction by 2050 is weak.



<Figure 9> Sociogram in period of Policy-discussion

Note: Circle means that actors who insists for 80 per cent of reduction target and inclusion of CO2 emission from aviation and shipping in target. Triangle menas that actors who insists for 60 per cent of reduction target and exclusion of CO2 emission from aviation and shipping in target. Meaning of color is same with previous period.

In terms of actors, the number is increased and NGOs shows the most take up of the actors. The specific character of the above sociogram is that NGOs are placed in periphery and core is occupied with authority level which are government and MPs. Also, relationship among actors in periphery is not seen tied because interaction of NOGs is represented by leading groups such as FoE, Stop Climate Chaos and Green Alliance. In the core, government and prime minister who had proposed low target in emission target and five-yearly carbon budget are placed in. And the only counterpart actors against high level actors were Conservative Party and FoE in the core. And Business/Industry actors did not show major role in the network. However, aviation is slightly dragged to central part because whether emission from aviation and shipping should be included in the carbon budget was one of the key issues in this period.

With regard to interaction, relationship of Government and MPs were distinctive as public consultation and pre-legislative scrutiny were the main channel to have interaction. Although NGOs sector conveyed their opinion to core via letter and interview with media, it was difficult to have frequent interaction for NGOs with government and MPs in the light of their role that is not drawing up and scrutinize the bill. Also, public consultation elicited many of views in various groups. But, stance on the bill of government was not changed so it's hard to say that government got influenced or reflected by the opinions of the other actors.[51)]

Viewed in its entirely, the structure of this period is

51) Including Cambridge, institutes published reports expressing that long-term reduction target on CO2 emission will be failed unless particular tool is missing. Nevertheless, Gordon Brown did not change his stance on the bill in this period.

characterized as high degree of centralization, closeness and vertical interaction.

3) The period of policy legislation

(1) Which one was the main actor?

In this period there are 37 actors appeared and this includes 16 actors from government/parliament, 17 actors from non-government and 4 actors from Business/Industry sector.

<Table 16> Centrality of Actor in period of Policy-legislation

Actor	Type	Degree Centrality (%)			Between Centrality	Eigen vector Centrality
		Symmetric	Out-degree	In-degree		
Government	GP	16.9	2.8	16.9	326.9	0.413
Friends of the Earth	NG	11.3	9.6	2.4	280.3	0.212
DECC	GP	10.0	4.7	9.2	351.2	0.531
Conservative Party	GP	7.3	4.7	5.1	145.8	0.355
CCC	GP	6.2	4.5	3.2	22.4	0.437
LD Party	GP	5.6	4.3	3.8	29.6	0.360
Labour Party	GP	4.7	2.8	3.8	39.5	0.191
Green Party	GP	3.2	1.1	2.8	27.5	0.063
Stern(Report)	NG	2.1	2.1	0.2	4.9	0.000
WWF-UK	NG	1.9	1.9	0.2	0.2	0.026
Gordon Brown	GP	1.9	0.6	1.7	45.3	0.045
IPCC	NG	1.9	1.9	0.2	5.7	0.045
DEFRA	GP	1.9	0.4	1.5	68.1	0.000
Institute	NG	1.7	1.5	0.2	5.0	0.000
Business &	BI	1.7	0.9	1.3	31.4	0.061

Industry						
Radio Head	NG	1.7	1.7	0.6	132.7	0.041
Aviation	BI	1.5	0.3	1.5	0	0.000
Green Peace	NG	1.3	1.3	0.2	4.1	0.026
Green Alliance	NG	1.3	1.1	0.4	0	0.034
Royal Commission	NG	1.3	1.3	0	0	0.000
Mayor of London	GP	1.3	1.3	0.6	73.2	0.002
Joint Committee	GP	1.1	1.1	1.1	7.1	0.066
CBI	BI	1.1	1.1	0.2	16.2	0.040
United Nations	NG	0.9	0.9	0	0	0.000
European Union	NG	0.9	0.4	0.4	0	0.000
Al Gore	NG	0.6	0.4	0.2	0.3	0.000
Celebrity	NG	0.6	0.6	0	0	0.000
DT	GP	0.6	0.4	0.2	0	0.000
National Audit Office	GP	0.6	0.6	0	0	0.000
ABI	BI	0.6	0.4	0.4	36.5	0.000
Stop Climate Change	NG	0.6	0.4	0.2	0.2	0.000
LGA	GP	0.4	0.4	0	0	0.000
Environment Agency	GP	0.4	0.4	0.2	0	0.000
SD Commission	GP	0.4	0.4	0	0	0.000
Christian Aid	NG	0.4	0.4	0	0	0.000
I Count	NG	0.2	0.2	0	0	0.000
Oxfam	NG	0.2	0.2	0	0	0036

As appeared in above table, Government turns out to be the most important key actor who gave and received the influence on climate change bill. It's because pointing out from many actors who

appeal on the bill goes to government. Accordingly, the second most influential actor, Friends of the Earth, could be more interesting results as they are the only NGOs sector among the actors highly ranked. DECC is established as implementation agency is demanded. And CCC is also new and influential actor in this period. Despite this period focuses on legislative process in parliament, NGO sector is shown as important actor. Business/Industry actors take a relatively low portion in terms of degree of centrality.

As indicated in out-degree of centrality, FoE was the most influential actor likewise period of policy suggestion. It means they had the strongest will to build the legal framework in climate change in entire process. Also, scientific and economic evidence such as Stern report and IPCC are seen as an important components among the NGO sector. Within Government and Parliament sector, remarkable feature is not found. In the matter of In-degree of centrality, Government and DECC are pointed out frequently and there is no particular actor except government sector. It implies that the government who wrote up the bill and is supposed to prepare implementation strategy was the main concerns among the actors.

Except Government and Parliament sector, FoE, Radio Head, and Mayor of London appeared as policy broker. FoE had taken leading role in terms of collecting the public opinion and conveying to government like before. And Radiohead had worked closely with FoE and met politicians by themselves as well. Mayor of London is also placed in suitable position to hear the public voice and deliver to high-level actors.

In terms of Eigenvector Centrality, FoE is the only actor connected tightly with the key actors who handles the drawing up and legislate the bill with authority.

(2) Interaction among the actors

① Amount of emission reduction in target and emission from aviation and shipping.

While the bill was discussed in Parliament, The stance of government and Prime minister on the bill was clear. They believed that 60 per cent of target on emission reduction and excluding emission from aviation and shipping are enough for effort against global warming. Furthermore, Gordon Brown[52] urged for transition toward renewable and nuclear energy with worrying about economic depression in UK. In line with minister, DEFRA avoided to mention for specified target, while it agreed with serious impact of climate change. Response on the bill of Conservative Party was lower than any other previous periods. Particularly, David Cameron, leader of Conservative Party, made green campaigner disappointed as he rarely mention on the bill. In this period, the interest of Conservative Party was away thus he failed to win his MPs over. From among the MPs, Liberal Democrat and Green Party were the only MPs continuously raise the above 80 per cent target in emission reductio n.[53]

Stance of NGOs are also clear in a different way against Government which are 80 per cent of reduction target and including emission from aviation and shipping. Nicholas Stern urged for the need of 80% target in emission reduction. Furthermore the report of

52) Gordon Brown said he will put this evidence to the committee on climate change and ask it to advise us, as it begins to consider the first three five-year budgets, on whether our own domestic target should be tightened up to 80 per cent.

53) Liberal Democrat and Green Party urged for stronger goal in emission reduction by setting out it as 80% and 90% respectively

Sustainable Development Commission (SDC) published that the UK will fail to achieve the reduction target obliged to Kyoto Protocol.

Big Ask campaign had never stopped. they made 'climate change bill week of action' in May, 2008 and support 'Big London public meeting on climate change bill' organized by Stop Climate Chaos. By supporting these civil move, Radiohead who lead the public participation with FoE together urged for stronger target in emission reduction in his concert and media interview. These kinds of moves appeared in online as well. A new online campaign is designed to take the bill further. A group of '10 green bloggers' assembled in Westminster office to share their opinion with MPs. With expressing serious concern, The UK's leading environmental campaign groups[54] have accused the main political parties of failing to prepare for the challenges of climate change. Interaction of business and industry sector with other actors are rarely shown in this period. They agreed with need of the bill but did not mention their desired reduction target until a month ahead enactment of the bill.[55]

Eventually the controversy in this period ends since the report of Committee on Climate Change published. The committee said a more stringent target than the 60 per cent cut currently outlined in the Climate Change Bill was needed, because information they had studied suggested the dangers of global warming were greater than previously thought.[56] Edward Miliband told MPs in his statement to

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54) The coalition includes Campaign to Protect Rural England, Friends of the Earth, Green Alliance, Greenpeace, National Trust, RSPB, The Wildlife Trusts, Woodland Trust and the WWF.

55) Dr Neil Bentley, CBI director of business environment said "Raising the target to 80% will increase the challenge to business, but we believe that UK firms will continue to rise to this challenge. We agree with the committee's assessment that such a major emissions reduction can be achieved at a manageable cost, but only if the right policies are put in place." on October 2008.

the House of Commons said the government accepts all of the recommendations of the Committee on Climate Change.[57)]

Environmental NGOs welcomed the decision of leader of DECC. But they kept urging for inclusion of emission from aviation and shipping which are last demand for stronger bill. Including FoE, green campaigner put continuous effort into lobby to MPs and it's accepted by Parliament. The interaction of this period was basically not favorable to public in the light of legislative process. Nevertheless, consistent effort of civil society without supportive power from MPs made their demand reflected into legislative system successfully.

② Legislative process

The Bill was introduced to the House of Lords by the Government on 14th November 2007. The first debate on the floor of the House, also called Second Reading, was held on 27th November 2007 and lasted six hours. This was followed by eight sittings in the Committee Stage, four further sittings at Report Stage and one more for Third Reading. And the bill was submitted to the House of Commons on 1st April 2008. The stage was progressed as same as Lords and the bill went through process of amendments.

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56) In a letter to the new Energy and Climate Change Secretary Ed Miliband, the committee's chairman Adair Turner said the tougher target would be "challenging but feasible", and could be achieved at a cost of 1 to 2 per cent of GDP in 2050. This could cost the country an extra £40bn a year. He also said a cut of 80 per cent on 1990 levels by 2050 should cover all emissions - not just carbon dioxide - and all sectors of the UK economy including shipping and aviation.

57) Edward Miliband said that "We will amend the Climate Change Bill to cut greenhouse gas emissions by 80 per cent by 2050, and that target will be binding in law."

<Table 17> Timeline of legislative process

House	Stage	Date
House of Lords	First Reading	14th Nov 2007
	Second Reading	27th Nov 2007
	Committee Stage (8 sittings)	11-12th Dec 2007
	Report stage (4 sittings)	25th Feb - 18th Mar 2008
	Third Reading	31st Mar 2008
House of Commons	First Reading	01st Apr 2008
	Second Reading	09th Jun 2008
	Committee Stage (10 sittings)	24th Jun - 08th Jul 2008
	Report stage	28th Oct 2008
	Third Reading	28th Oct 2008
House of Both	Consideration of Amendments	17-18th Nov 2008
	Royal Assent	26th Nov 2008

Two remarkable moments occurred in Reporting stage from House of Lords. One of the votes rejected a proposal by a majority of 148 to 51 to change the target for 2050 from 60% to 80% below baseline 1990 emissions on the basis that they should wait for new scientific advice from the Committee on Climate Change before changing the target from 60%. And They passed an amendment to the Climate Change Bill to prevent the government using carbon credits to meet more than 30% of its carbon reduction targets. But, the government plans to reverse this amendment.

After the bill is submitted to House of the Commons, following the Second Reading, The climate change bill, which was granted a second reading by 344 votes to 3, will set a legally binding target for reducing the UK's CO2 emissions by at least 60% by 2050. Like House of the Lords did, the first agreement on reduction target in the Commons was 60 per cent. However, the Committee on Climate Change's advice on the level of the 2050 target was brought forward at the end of the period and it suggested that the 2050 target should be revised from 60 per cent of 1990 CO2 emissions to 80 per cent of the six major greenhouse gas emissions at the instigation of the government.

Since then, 57 MPs pressed for the emission from aviation and shipping to be included in the Climate Change Bill, which sets a target to cut carbon emissions by 80% by 2050 and The government agreed to redraft its bill, which was given a third reading by 463 votes to 3. Accordingly, it was also agreed that the emission of aviation and shipping emissions would form part of the target. Finally, the bill passed into law by receiving royal assent on 26 November 2008.

③ Scientific evidence

The report conducted by credible scientist group played an important role on interaction among the actors as it becomes data leading the controversion to forward. The original 60% reduction target of the bill was adopted based on the recommendation of the Royal Commission on Environmental Pollution. If adopted by other countries too, a 60% cut by 2050 was thought likely to limit atmospheric carbon dioxide concentrations to no more than 550 parts

per million which, it was generally thought at the time, would probably prevent global temperatures from rising by more than 2°C and so avoid the most serious consequences of global warming.[58]

However, the debate of impact on climate change had moved to new phase since IPCC report has been published in 2007. The IPCC, comprised of experts from around the world, concluded that recent temperature rise was "very likely" down to human emissions of greenhouse gases and climate change is "unequivocal". They warned that average global temperatures could rise by 4C this century if emissions continue to grow. Also, the chair of the IPCC warned that emissions from shipping is much worse than feared.[59] The IPCC was the one of the actor urging for 80% reduction target.[60] And government admitted the result and referred it.[61]

Futhermore UN criticized the UK government, urging to raise the emission target.[62] While praising the government for a "bold and

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58) Hilary Benn, leader of DEFRA, said "Because we've got a process for deciding how to strengthen the target. We recognize the science has moved on since the 60% figure, which was a recommendation from the Royal Commission on Environmental pollution."

59) Dr Rajendra Pachauri, chair of the IPCC, said: "This is a clear failure of the system. The shipping industry has so far escaped publicity. It has been left out of the climate change discussion. I hope [shipping emissions] will be included in the next UN agreement. It would be a cop-out if it was not. It tells me that we have been ineffective at tackling climate change so far."

60) In May 2008, experts from the Intergovernmental Panel on Climate Change said the G8 goal "will not avoid global impacts". They said the target should be tightened to a 80% cut in world emissions by 2050.

61) Benn emphasized the importance of target by saying that "It is what the IPCC says, it fits with the 26-32% reduction in our climate change bill, and it provides part of the context, which is that we're all going to have to do a lot. The most important thing is that we get agreement."

62) The report criticized the UK government, saying that ""If the rest of the developed world followed the pathway envisaged in the UK's climate change bill, dangerous climate change would be inevitable".

innovative" climate change bill that would legally bind ministers to mandatory cuts in emissions, the UN said there were "serious questions about the level of ambition - and about the UK's capacity to meet its own carbon reduction targets". Also, The UN report criticised the government for excluding shipping and aviation from the UK's target. Taken together, the UN said, the two sources of greenhouse gases would increase the UK's carbon budget by 27% by 2050, cancelling out half the planned 60% reduction.

The result of scientific study by UN was that greenhouse gas concentrations will go up to 750ppm by 2050, giving possible global temperature increases of 4-5C, well above the 450ppm and 2C rise that experts say it must be the limit. The report says that the UK is on track to meet its Kyoto protocol targets because emissions are 5% lower than in 1990, the base year. But it says all the reductions were achieved before 2000, when power generation switched to gas from coal.

In terms of achieving the target, National Audit Office (NAO) investigation strongly criticised the government for using two different carbon accounting systems. its report insisted in March 2008 that one system, which the government presents to the UN and in public, Britain emitted 656m tonnes of CO2 in 2005, and claims an improvement on 1990 baseline. However, the lesser-known but more accurate data in the government's national environmental accounts show emissions to be in the region of 733m tones in 2005 according to NAO. Based on this report, NAO said Britain's climate change emissions may be 12% higher than officially stated. After reviewing this report, opposition parties and environment groups accused the government of misleading the public at a time when the UK claims to be leading the world in achieving reductions[63)]

Lastly, the most influential report is published Committee on Climate Change and submitted to DECC. The report includes that changed situation since the UK adopted a 60 per cent target, global emissions reduction trajectories, appropriate UK contributions to global emissions reductions, costs of reducing emissions, coverage of the proposed target and so on. Publication of the report was the decisive to change government to 80 per cent of reduction target as described in part of target above.

As many of scientific results are proved by scientist sector domestically and internationally, scientific evidence on climate change is the catalyst encouraging the active and accurate interaction among the actors. Especially, the result provide strong and reasonable evidence to the actors who demands ambitious target.[64)]

(3) Linkage structure

<Table 18> Indicator for structure in period of Policy-legislation

Density (%)	Degree Centrality(%)	Centralization (%)	Geodesic Distances
11.3	15.1	74.0	2.7

63) "This report raises profound questions about the credibility of the government's approach to reducing carbon emissions. In the absence of reliable and honest reporting the results could be potentially disastrous", said Peter Ainsworth, shadow secretary of state for the environment.

64) Spokeswoman for Camp for Climate Action said "The science shows that we only have a few years left to avert catastrophic climate change," and European environment commissioner said that "It is worth fighting for those numbers. Science tells us that these reductions are necessary. Logic requires that we listen to science. I hope that everybody responds in a logical way."

In this period, density is 11.3% which is almost similar degree with previous period. Degree Centrality is lower than previous period. In terms of Centralization, it turns out that the period has the most centralized structure in entire period as amount of 74%. It implies that a lot of interaction occurred in core part. Geodesic Distances in this period was increased than previous period which means distance among actors estranged and it indicates that immediacy and efficiency are lower than any other periods.

Followed above results, this period shows high degree of closure and authorization in terms of structure.

(4) Synthesis of the period

The key issues that were discussed intensely are identified as reduction target in emission and including the emission from aviation and shipping in target. Expressing the concern for economic depression, government and labour party tried to avoid the 80 per cent reduction target. And they insist on need of nuclear power that is able to make CO2 emission less. Similar stance appeared from conservative party that urged strongly for rigid reduction target in previous period. Although some of conservative MPs still agreed with 80 per cent target, David Cameron had a difficulty to persuade his MPs to continue to have strong interest on the bill. And the party take an affirmative position on need of nuclear power raised by labour party.

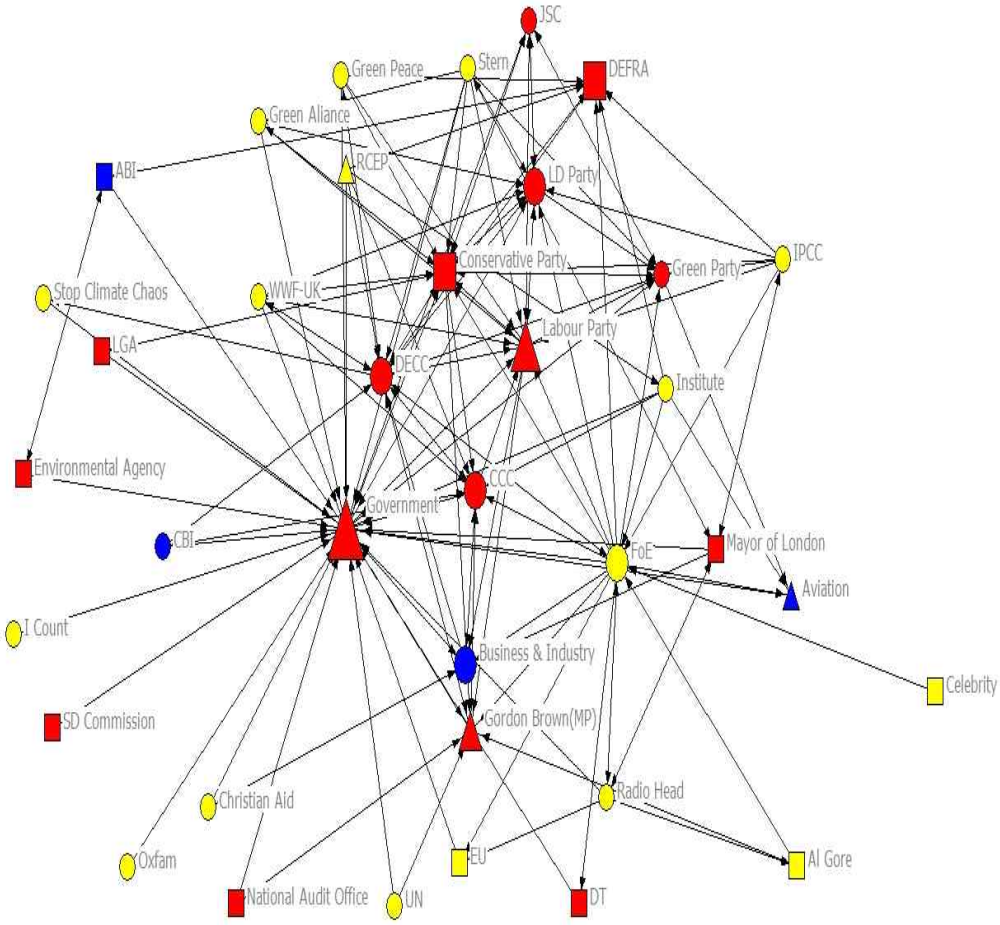
As assumed, business and industry sector including aviation avoided to mention the specific number for reduction target. However they expressed they would take the 80 per cent reduction target in their policy and strategy only if the government promise the

reasonable aid and subsidy for low emission economy.

In contrast, NGOs and rest of the MPs such as liberal democrat party and green party were the only actors that had continuously urged for strong reduction target and inclusion of emission from aviation and shipping with constant voice and action.

In this situation, scientific evidence gave the actors who give a pressure to the government supportive power to them. As climate change issue is hard to be proved whether it affect to people ,whilst most of actors agreed the risky impact from it, the actors present the grounds through not only domestic study in UK but also scientific data researched internationally including IPCC and UN. Furthermore, NAO criticized the government for unlikelihood of the emission data presented by government with their own study not just urging for the strong reduction target for future.

To sum up, the opinion of government and both of major parties on the target and objective range of emission was lesser and weaker. However, NGOs with scientific evidence and report of committee on climate change push ahead with a strong target. As a result, the exertion of actors, urging for 80 per cent of reduction target in emission and inclusion of emission from aviation and shipping, are reflected in the bill. Still, the bill allows for an unlimited number of international offset credits to be used in meeting these targets though, it is shown that the actors strike the right balance, taking the position of government into consideration.



<Figure 10> Sociogram in period of Policy-legislation

Note: Meaning of color and figure is same with period of policy-discussion

The most actors are seen compared to any other periods and government and MPs are positioned in core. Business and industry are identified as low influential actors in spite of controversion of their emission. The most important actor turns out to be government. DECC and CCC are positioned in core as well despite they were

established at the end of the period. As the responsibility on the bill was delegated to DECC from DEFRA, DEFRA is pulled out to periphery. Although FoE is not placed in core, it shows active interaction. And external actors such as UN, Al Gore, and IPCC had an influence to core directly and via NGOs.

Interaction in core is shown actively and NGOs including FoE and institute in periphery still connected to core like previous period. The remarkable feature of this period is the type of figure appeared in core. It is seen that all kind of figure which are circle, square and triangle are emerged and it implies that the opinion was divided among the key actors. Actually, government and labour party laid out weak target and DECC and CCC recommended strong target with acceptance by DECC. And conservative party insisted on weaker target by avoiding specific mention on target.

As described in structure part above, low density, high centralization, and far geodesic distances also appeared in the sociogram. Also, distance of connected line between core and periphery is shown as farther than previous period.

2. Comprehensive Analysis

1) Changes in the policy-making process

(1) Change of the number of key actors

The total number of actors classified by sector is appeared as the following <Table 19>.

<Table 19> number of actors changed

Period	Policy suggestion			Policy discussion			Policy legislation		
Sector	GP	NG	BI	GP	NG	BI	GP	NG	BI
Number	10	11	2	14	18	4	16	17	4
Total	23			36			37		

On the contrary to period of Policy-suggestion, more actors have been found in Policy-discussion and legislation in terms of the number of actors. At the same time, the majority of players engaged in the policy making are from non-governmental sector. In contrast, Business and Industry sector has shown least involvement in the process. Amongst different actors, the ones that identified as the majority taking 2 percent above of proportion in degree centrality, are highlighted in <Table 20>

<Table 20> Number of main actors changed

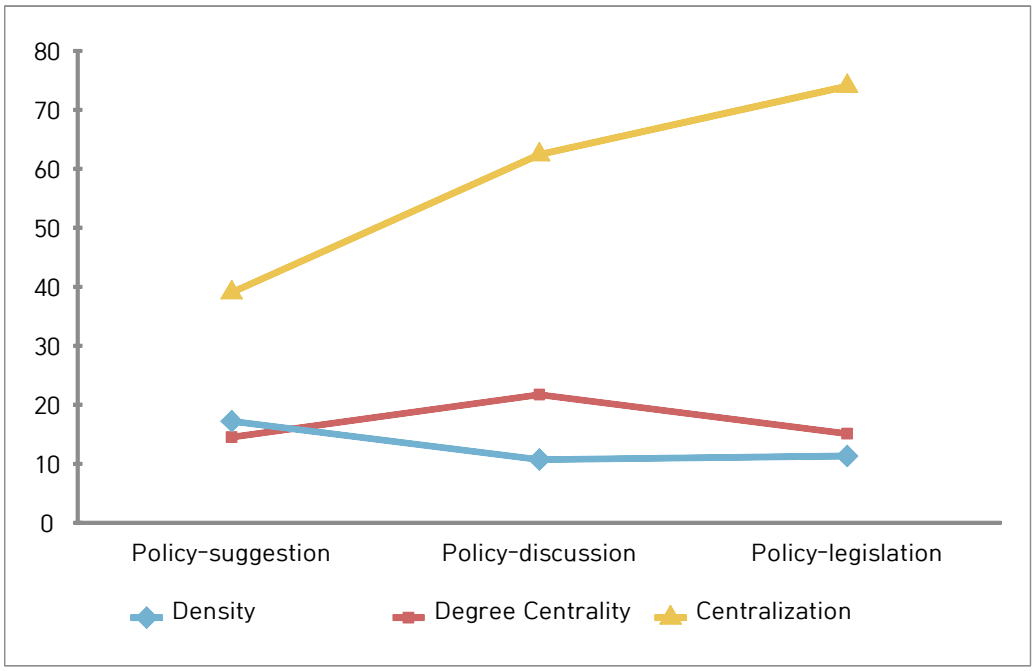
Policy-suggestion		Policy-discussion		Policy-legislation	
Actor	Type	Actor	Type	Actor	Type
Government(17.8)	GP	Government(24)	GP	Government(16.9)	GP
Conservative Party(12.5)	GP	DEFRA(11.4)	GP	FoE(11.3)	NG
FoE(12.5)	NG	Gordon Brown(10.6)	GP	DECC(10.0)	GP
Tony Blair(12.5)	GP	Conservative Party(10)	GP	Conservative Party(7.3)	GP
SCC(10.6)	NG	Tony Blair(8.6)	GP	CCC(6.2)	GP
LD Party(8.3)	GP	FoE(7.7)	NG	LD Party(5.6)	GP
Stern(8.3)	NG	LD Party(6.3)	GP	Labour Party(4.7)	GP
DEFRA(6.8)	GP	Labour Party(3.4)	GP	Green Party(3.2)	GP
Institute(3.8)	NG	Joint Committee(3.4)	GP	Stern(2.1)	NG

Labour Party(3.4)	GP	Green Party(3.1)	GP	
Green Party(2.7)	GP	Aviation(3.1)	BI	
Green Peace(2.3)	NG	SCC(2.9)	NG	
WWF-UK(2.3)	NG	WWF-UK(2.9)	NG	
		CEAC(2.9)	GP	
		Christian Aid(2.9)	NG	
		Institute(2.6)	NG	
		Celebrity(2.3)	NG	
		EAC(2.0)	GP	

In period of policy-suggestion, similar number of actors in Government/Parliament and Non-governmental sectors are identified. Government/Parliament played a key role during policy-discussion period. Although Non-governmental players are consistently shown in the table, Government/Parliament sector is observed as the most important stakeholder in this period. As CO2 emission from aviation and shipping became the key agenda on the bill, Aviation, which is classified as Business and Industry, are found as a main actor. In period of policy-legislation, the most important actors belong to sector of Government/Parliament. However, two Non-governmental sectors, which are FoE and Stern with their report, played a critical role in this period.

In short, Non-governmental and Government/Parliament sectors are regarded as a main actors in the initial period of policy-making process., The Government/Parliament sector demonstrated its leadership in the process for the bill to be successfully recommended for the legislation while. Non-governmental sector made significant contribution during the period of policy-discussion. Nevertheless, FoE and Stern also influenced in the legislative process

(2) Change of structure



<Figure 11> Graph indicating structural change

The highest degree of density is shown in the period of Policy-suggestion. It means that interaction among the actors were progressed in various levels from public to government. In the other periods, the degree of density decreased due to the feature of the period and the increased number of actors. Accordingly, the period of Policy-suggestion turns out to be tightly connected than the other periods.

The degree centrality indicates the influence focused to a specific actor in relation to others. The degree is the highest in the period of Policy-discussion because the government was receiving a lot of inputs and influence from different interest groups.

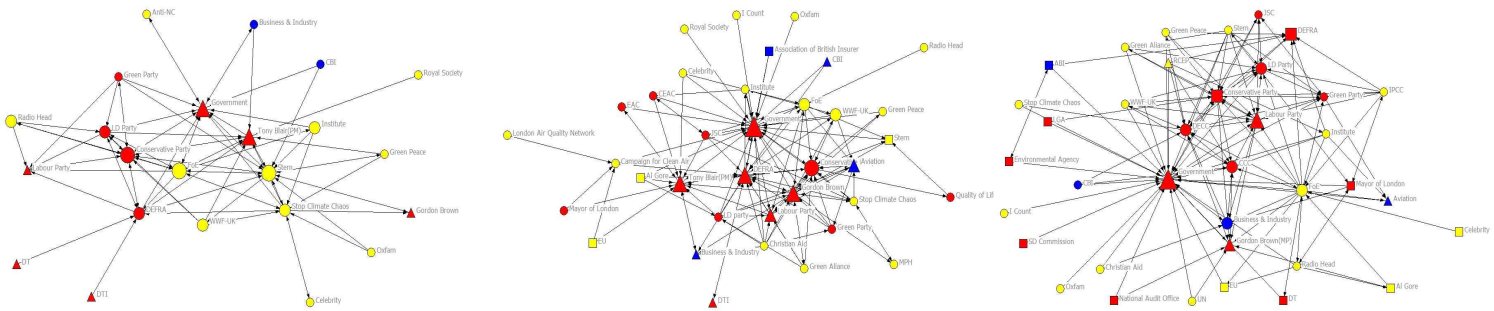
In terms of centralization, its degree in the period of Policy-suggestion is low. However, it becomes higher toward the end, which indicates that centralized interaction and structure appeared in periods of Policy-discussion and Policy-legislation. Therefore, it can be deduced that the period of Policy-suggestion had more open and horizontal interaction and structure. On the other hand, it turns out to be more closed and vertical in the periods of Policy-discussion and legislation. The followed table indicates specific figures related with structure.

<Table 21> Change of indicator of structure

Indicator	Policy-suggestion	Policy-discussion	Policy-legislation
Density	17.2%	10.7%	11.3%
Degree Centrality	14.5%	21.7%	15.1%
Centralization	39.0%	62.4%	74.0%
Geodesic Distances	2.1	2.4	2.7

Lastly, the degree of Geodesic distances gradually increases. As it indicates the least step to reach to each actor, the distance among the actors are farther. Accordingly, it can be deduced that the reachability and power of spread are lower to the end.

(3) Change of Sociogram



<Figure 12> Change of Sociogram

In period of Policy-suggestion, there are few actors and opened networks. Since distances among each actors are short and close, interactive dialogues were present. Especially, the balance of Government/Parliament sector and Non-governmental sector shown in core part is remarkable. In terms of the period of Policy-discussion, there are increased actors and centralization is observed. Government/Parliament sector placed in fundamental initiatives and their interactions were actively progressed. However, connection among periphery part is not captured in this period. In the period of Policy-legislation, the number of actors sustains similarly with previous period. Still, centralization is observed. The remarkable feature of this period is that the distance among the actors are farther than any other periods. This means that interaction of particular actors was difficult to reach to each other.

2) Analysis of policy-making process by policy network

<Table 22> Synthesis of policy-making process on the climate change bill

Level of analysis		Policy-suggestion	Policy-discussion	Policy-legislation
Actors	Number of Actors	23	36	37
	Key actors	13[65]	18[66]	9[67]
	Stance	- Need of legal framework for reduction target on CO2 emission	- Reduction target (60% vs 80%) - Inclusion of CO2 emission from aviation and shipping	- Reduction target (60% vs 80%) - Inclusion of CO2 emission from aviation and shipping
Inter-action	Frequency	High	High	High
	Direction	Two-way	Two-way	Two-way
	Event	- Big ask campaign - Publication of Stern review	- Public consultation - Pre-legislative scrutiny	- Legislative process - support with scientific evidence
Struc-ture	Degree Centrality	14.5%	21.7%	15.1%
	Density	17.2%	10.7%	11.3%
	Centrali-zation	39.0%	62.4%	74.0%
	Geodesic Distances	2.1	2.4	2.7
	Structural Features	- Openness - Horizontal	- Openness - Vertical	- Openness - Vertical
Network Pattern		Issue Network	Issue Network	Issue Network

65) Government, Conservative Party, FoE, Tony Blair, SCC, LD Party, Stern, DEFRA, Institute, Labour Party, Green Party, WWF-UK

66) Government, DEFRA, Gordon Brown, Conservative Party, Tony Blair, FoE, LD Party, Labour Party, Joint Committee, Green Party, Aviation, SCC, WWF-UK, CEAC, Christian Aid, Institute, Celebrity, EAC

Based on the results of analysis so far, the network pattern for entire periods turns out to be issue network. In the period of Policy-suggestion, there were interactions among various actors and extensive interest on the issue. Although the relationship of authority is unequal and structural features are opened and horizontal. In the period of Policy-discussion, the number of actors increased and the structure centralized as the main interaction and authoritative decision occurred in the Government and Parliament. Accordingly, a few actors possess the authority and structural feature has changed from horizontal to vertical. Likewise, it happens in the period of Policy-legislation. As legislative process was conducted by the Government and Parliament, Non-governmental sector was not able to participate in the process. Although they raised their voice through various ways, inequality of authority still existed.

3) Verification of research questions

To verify the first research question, it is important to note that the most important actors in the period of Policy-suggestion were Government, Conservative Party, Friends of the earth, Tony Blair, Stop Climate Chaos, Liberal Democrat Party, Stern, DEFRA, Institute, Labour Party, Green Party, Green Peace, and WWF-UK. In this period, the most remarkable feature was the strong will of leaders in the Conservative Party and Friends of the Earth. Particularly, civil society collected and put together public opinion through 'Friends of the Earth' and 'Stop Climate Chaos'. Another important players were 'Liberal Democrat Party' and 'Labour Party'

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67) Government, FoE, DECC, Conservative Party, CCC, LD Party, Labour Party, Green Party, Stern

And it's identified as Government, DEFRA, Gordon Brown, Conservative Party, Tony Blair, Friends of the Earth, Liberal Democrat Party, Joint Committee on the draft Climate Change Bill, Green Party, Aviation, Stop Climate Chaos, WWF-UK, Commons Environmental Audit Committee, Christian Aid, Institute, Celebrity and Environmental Audit Committee for period of Policy-discussion. In this period, Conservative Party, Friends of the Earth and Liberal Democrat Party were consistently recognized as main actors as Governmental sector. Additionally, some of committee and Aviation emerged in this period.

For the period of Policy-legislation, the most important actors are identified as Government, Friends of the earth, DECC, Conservative Party, Committee on Climate Change, Liberal Democrat Party, Labour Party, Green Party, and Stern.

During in this phase, the window of discussion was formed between Parliament and Government. However, it is also essential to recognize the efforts of 'Friends of the Earth' and 'Stern'

For the second research question, formation of coalition was the most important way of interaction in the period of Policy-suggestion. The first coalition was internally formed in Non-governmental sector and opposition parties and then both of sectors formed coalition group to give pressure to the Government and ruling party. Consequently, the discussion window on the bill opened when the Stern review was released. For the period of Policy-discussion, the coalition that had been formed persisted to this period and interaction between the Prime Minister and the leader of Conservative Party was fierce. The major issues that NGOs and opposition party insisted were 80 percent of reduction target in CO2 emission and inclusion of emission from aviation and shipping against government. To collect

the opinion from the various sectors, the Government convened public consultation on the bill and received the report of pre-legislative scrutiny from MPs. However, the Government have not yet reflected those opinions. The reduction target and inclusion of emission from aviation and shipping did not change until the report came out by the Committee on Climate Change at the end of period of Policy-legislation. Although the Government to change changed the contents of the bill mainly due to the report prepared by the Committee on Climate Change, it turns out that many scientific evidences including reports from IPCC, UN, and institutes have impacted bill to change more significantly.

The remarkable feature of interaction in the period of Policy-suggestion is identified as coalition. In terms of the period of Policy-discussion, there was no particular interaction. Despite public consultation and pre-legislative scrutiny conducted by the Government and Parliament , neither policy change nor decision was observed. In the period of Policy-legislation, some of reports including scientific evidence as well as consistent efforts of the civil society ledto policy change shortly before the bill was enacted.

Regarding the third research question, the structure in the period of Policy-suggestion was open and horizontal. There were various routes for public opinion to be delivered to high-level including the Government and parliament. The leaders of NGOs and opposition party interacted via letters, interviews and face-to-face meetings. The leader of Conservative Party conveyed the public opinion to the Government as well to the Parliament. In terms of the period of Policy-discussion, the government started to draw up the bill. Accordingly, the discussion of policy was going on among different government agencies and members of the Parliament. Similar feature

occurred in the period of Policy-legislation because the discussion of policy occurred among Parliament. In spite of this phenomenon, 'Friends of the earth' tried to deliver their opinion to high-level. However, the entire structure of network was closed and vertical.

Verification of the last research question portrayed by network pattern changes. The result was that issue network appeared in entire periods. There are three reasons why this pattern of network impacted the policy-making process on the climate change bill in UK. Firstly, there was no limitation for actors to participate in the process, enabling an open environment. Secondly, a few actors possess the authority for decision making power such as Government and Parliament. Thirdly, the unequal relationship of authority contributed to this networking.

V. Conclusion

1. Findings

This research started to answer the question of "which factors enabled the establishment of the Climate Change Act in UK". Hence, main actors could be identified through National dailies in UK. The interaction among related players has been identified by reviewing the reports from government and institute, journal, interview and survey. Lastly, structural relationship is observed by using social network analysis. Conclusions were drawn through verification of research question presented in the following section.

Firstly, main actors in the policy-making process on the Climate

Change Bill were government, parliament and civil society. In the private sector, legal framework on reducing targeted CO2 emission was agreed but no specific reduction target was mentioned. Also, DEFRA and DECC were relatively active actors. David Miliband who served as the Secretary of DEFRA and Edward Miliband who served as the Secretary of DECC were one of favorable actors on the bill. Departments related to transportation, business and industry did not appeared as main actors.

Secondly, influence of civil society through 'Friends of the Earth' (FoE), 'Stop Climate Chaos', and 'Green Alliance' were effectual in the policy making process. Particularly, FoE turns out to be an important actor that has been making consistent and active actions throughout the entire periods inthe process. FoE played a decisive role for announcement for the bill by Labour party in cooperation with cross-party between Conservative and Liberal Democrat party in period of policy-suggestion. FoE suggested their idea and opinion on the bill in period of policy-discussion. Even though it lost strong support from the Conservative party, FoE influenced the Government and Parliament with various actions including continuous lobbying to MPs . Through this efforts, the final version of climate change bill has included provisions that FoE strongly insisted eventually. It also proves that effective role of the civil society in the policy making process on climate change bill.

Thirdly, Pressure from opposition party including Conservative, Liberal Democrat and Green Party made a strong impact to the government and ruling party in the policy making process. Particularly, aggressive will of David Cameron, the leader of the Conservative Party at that time, presented strong and immediate impact to the government and Prime Minster. In the period of

policy-suggestion, David Cameron strongly insisted for a legal framework on the reduction target on CO2 emission with Tony Juniper who is the Executive Director of FoE. Due to David's concern, the remarkable feature in the period of policy-discussion was the conflict between David Cameron and Gordon Brown. Also, the degree of green policy and interest in the period of policy-discussion were higher than any other period. Hence, each party was in conflict in identifying which organization had greener policy than other parties.

Fourthly, 'coalition' was the key word in the policy making process on the climate change bill in UK. In the period of policy-suggestion, coalition within the civil society and the opposition party was formed stably as a first coalition. 'Friends of the Earth' and the Conservative Party led each coalition as the representative respectively. In the period of policy-suggestion, these coalitions crossed the sector that were formed with goal of establishing 'legal framework on reducing the target on CO2 emission', 'above 80 percent of target on emission reduction' and 'inclusion of emission from aviation and shipping' were the aim of coalition in period of policy-discussion. In short, conflicting interaction between government and non-government including opposition parties existed in these two periods. Coalition crossed the sector was loosed with changed stance of the Conservative Party but coalition of the civil society succeeded in reflecting their opinion into the bill.

Fifthly, the Stern review was the first economic evidence that made an effective impact on policy making process. Shortly after this report was released, Tony Blair and David Miliband highly praised the report and Labour's government announced the adoption of the climate change bill by admitting the result of research in the report.

After the period of policy-suggestion, reports published from IPCC, UN, institutes and NAO that includes economic and scientific evidence were used as ground of actor's argument. In the period of policy-legislation, the Committee of Climate Change published the report, resulting UK should have 80 per cent of reduction target on CO2 emission and include emission from aviation and shipping in reduction target to meet target in the Kyoto Protocol. It was another important report containing the scientific evidence followed by the Stern review. Government accepted the result from report and reduction target has been modified a month before the enactment.

Sixthly, in the light of the goal of policy making process on the bill was pass of bill to law, structure of policy network in establishing the climate change bill in UK was vertical and authoritative. However, a lot of actors from various sectors participated in the network during the period of policy-suggestion with open and horizontal structure. In the period of policy-discussion. feature of structure changed to vertical because drawing up the bill is government responsibility But, more actors appeared than previous periods and interaction was going continuously. Hence, the structure of this period was opened. Lastly, various actors still had interaction with each other but, the role of the Parliament was the most important for this period. Accordingly, the structure of this period are identified as vertical and open.

2. Political suggestions

Through this research, the main factors of establishment of climate change act in UK was revealed by using policy network and social network analysis. By reviewing the factors, implication such as

described below can be deduced.

Firstly, a bond of sympathy for the need of legal framework of emission reduction across the whole sector was present. Although the most active actors supporting for the bill were from the opposition party and the civil society, the government recognized with need for a legal framework. At the same time, the business sector welcomed the long-term target because they can better prepare for future if they set up a comprehensive picture on emission reduction. The reason that these agreements was possible in UK is that different stakeholders were aware of preparing for a new global climate change system that is supposed to start from 2020.

Secondly, the role of civil society was very important and effective. The civil society was the only actor who raised consistent voice in the entire process. Through 'Big ask campaign', 'Friends of the Earth' played a triggering role and they were engaged in multi-stakeholder consultations. In terms of government's attitude, it is difficult to put their stance aggressively as they represent every actor in the country. The Parliament tends to change their opinion depending on the interest groups supporting them. Accordingly, the civil society is the focal point that speaks on climate change issue clearly and strongly. It is evident that the civil society influenced the policy making process through the case of UK.

Thirdly, economic and scientific evidence are important in the policy making process. Due to invisibility and intangibility of climate change issues, often there are challenges of appealing policy makers or the public. But, reports containing the scientific evidence played an important role in the process. Especially, Stern review and the Report of Committee on Climate Change were presented in the last puzzle in period of policy-suggestion and policy-legislation respectively. The report published by IPCC, UN, and institute was the driving force enabling the actors to argue and insist their opinion on the bill.

Fourthly, the coalition aiming for common goals is remarkable feature in UK's policy making process on the bill. Interaction of coalitions with well-organized opinion can elaborate the quality of discussion of policy and enable the efficiency by reducing the wasteful cost. As confrontations between government and non-government including opposition parties emerged during the policy making process, it was possible to interact on conflict efficiently and clearly.

Through the process of establishing the Climate Change Act 2008, this act has been the cornerstone t of climate change policy in UK. As an independent body to advise the government, the Committee on Climate Change provides specific information needed by the government so that DECC can set out the carbon budget and make better decisions. Business sector is also planning to establish the long-term strategy based on the carbon budget and reduction target on CO2 emission. These efforts made by the whole sector to correspondence against climate change aims that not only meeting the target of the Kyoto Protocol but also playing a leading role to promote international climate change agenda beyond 2020.

In Korea, Big ask campaign aiming to establish the climate change law for emission reduction with legally-binding manner has been started since 2013. Mrs. Han, Myung-sook, (title), and MPs of opposition party, have put forward a motion to the bill on 5th November 2014 with agreement supported by 62 MPs. Contents of the bill is identified as a long-term target by 2050 in the emission reduction, five-yearly plan of comprehensive climate change plan, Committee on Climate Change under President, and so on. Unlike before, Korea is not able to avoid mandatory reduction on GHGs emission since 2020. In this regards, this motion is a big step for climate change policy in the future. But, active interaction or conflict are not seen yet.

However, the main factors enabling the climate change bill enacted in UK are bond of sympathy across all the sectors, strong will of the civil society and opposition party, strong expression by leader of sectors, coalition with common goal, and scientific and economic evidence. In the light of the case of UK, we will have to wait and monitor for the climate change bill to be enacted in Korea.

3. Limitation of the research and further studies required

Firstly, there was difficulty in studying the specific interaction through social network analysis. This limitation would be solved if interview or survey have been conducted. Secondly, this research used only national media and terrestrial broadcasts for its data collection. But, the credibility of data will be increased if the range of data collection is expanded. Thirdly, one of the remarkable feature of policy making process on the climate change bill in UK was coalition. Therefore, using Advocacy Coalition Framework, one of the frequently used model in policy making process, would deduce interesting implication as well.

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국문초록

1997년 교토의정서가 채택되고 2005년부터 지금까지 발효됨에 따라 온실가스 의무감축국가들은 자국의 온실가스 감축을 위해 다양한 방식으로 기후변화정책을 수립해 왔다. 하지만 온실가스 감축량을 장기적으로 명확하게 설정한 후 이를 국내법의 형태로 제정하여 온실가스 감축을 비롯한 기후변화정책의 법적 체계를 세운 국가는 없었다. 그럼에도 불구하고 영국은 2008년 기후변화법(Climate Change Act)을 세계 최초로 제정하여 2050년까지의 온실가스 감축목표를 법으로 명시하였고 이러한 목표 달성을 위해 5년 주기의 탄소예산을 설정해두고 있다. 또한 영국은 기후변화위원회(Committee on Climate Change)라는 독립된 기구를 설립하여 기후변화정책에 대한 과학적, 정책적 조언을 얻고 있는 상황이다.

본 연구는 '어떠한 요인을 통해 영국이 기후변화법을 제정할 수 있었는가?' 라는 질문을 통해서 시작되었다. 이를 위해서 분석방법으로는 정책네트워크분석과 사회연결망분석을 사용하였다. 또한 영국의 기후변화법 제정과정은 3개의 시기로 구분되는 특징을 보이는데 이는 정책제안기 - 정책토론기 - 정책입법기로 나누어질 수 있다. 사회연결망 분석의 자료로는 영국의 주요일간지 및 방송매체의 기사에서 추출하였다. 이러한 분석방법과 자료를 통해서 본 연구는 영국의 기후변화법 제정과정에 있어서 가장 중요한 행위자와, 상호작용, 연계구조 그리고 정책네트워크 유형의 변화를 포착하고 이에 대한 변화과정을 살펴보았다.

분석결과로 영국의 기후변화법 제정과정에서 가장 중요한 행위자는 정부, 의회 그리고 시민단체인 지구의 벗(Friends of the Earth)인 것으로 드러났다. 정부의 경우 기후변화법안에 찬성은 하지만 적극적인 입장을 취하지는 않았다. 의회의 경우 야당인 보수

당과 자유민주당은 기후변화법안에 적극적으로 찬성하는 입장을 취했으며 마지막으로 지구의 벗을 포함한 시민사회의 행위자들도 영국의 기후변화법 제정과정에 있어서 중요한 행위자인 것으로 나타났다. 상호작용의 경우 의회와 시민사회 영역 내에서의 1차 연합이 형성되었고 이렇게 형성된 두 연합은 다시 2차 연합을 형성하여 정부에게 영향력을 가한 것으로 나타났다. 이러한 연합은 마지막 시기인 정책입법기에서는 약해지게 되지만 지구의 벗을 중심으로 시민사회 간이 연합은 끝까지 기후변화법 제정과정에 영향을 주었던 것으로 확인되었다. 관계구조의 경우 개방적이지만 수직적인 구조를 보였으며 정책네트워크의 유형은 정책형성과정의 전체 시기 모두 이슈네트워크의 형태를 보이고 있었다. 이 외에도 경제적이고 과학적인 증거를 토대로 작성된 보고서 역시 제정과정에 영향을 준 것으로 드러났다.

이러한 분석결과를 통해서 도출되는 시사점은 다음과 같다. 기후변화에 대응하는 법의 제정을 위해서는 첫째, 법적 구속력을 갖는 온실가스 감축에 대한 공감대 형성이 중요하다. 둘째, 시민사회 역시 주요 행위자로 역할을 해야 한다. 셋째, 경제적 및 과학적 근거의 뒷받침이 중요하다. 그리고 마지막으로 공동의 목표를 지향하는 연합의 형성이 주효한 요인이라고 볼 수 있을 것이다.

주요어 : 기후변화협약, 기후변화정책, 정책네트워크, 사회연결망 분석, 기후변화법

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