STUDY ON REGIONAL REGIME FORMATION

CONCERNING DUST AND SAND-STORM PROBLEM

IN NORTHEAST ASIA

A Thesis

by

KIM HYEJI 47116796

in Partial Fulfillment

of the Requirements for the Degree

Master of Science

Advisor: Professor Kameyama Yasuko

Co-Advisor: Professor Makoto Yokohari

Graduate Program in Sustainability Science

Graduate School of Frontier Sciences

THE UNIVERSITY OF TOKYO

March 2013

STUDY ON REGIONAL REGIME FORMATION

CONCERNING DUST AND SAND-STORM PROBLEM

IN NORTHEAST ASIA

ABSTRACT

In Northeast Asia, massive Dust and Sand Storm (DSS) arises in arid and semi-arid areas in China and Mongolia, and it makes trans-boundary impact on Korea and Japan. With scientific identification of increasing frequency and intensity of DSS, the voices about building institutionalized regime to avoid larger scaled negative effects of DSS have become stronger, but study on such regime creation has not been blossomed in this region. Despite of occurrences of numerous national/bilateral/multilateral countermeasures and discussion channels which aim to set legally-binding management system, however, there is no visible result so far. Therefore, considering such a long history of multi-dimensional efforts toward regime creation and low efficiency of those efforts, the question why regime has not been able to create in Northeast Asia for DSS mitigation is raised. Based on this curiosity, there are two main research questions 1) what is the biggest obstacles to encourage each stakeholder be cooperative and mitigate DSS problem, and 2) Do current DSS countermeasures make a progress on problem solving. By answering those two questions, this paper aims 1) to identify the key factor to solve DSS problem, and 2) to verify the indispensability of transboundary regime to promote such key factor and then, to solve the problem. Instead of concentrating only on traditional regime building, the research hypothesizes new regime building for DSS problem, which considers the involvement of non-state actors as a core member and highlights the significance of voluntarily participated cooperation. For answering these two and measure the reliability of such hypothesis, the survey through questionnaire and interview is the main methodology of this research as well as literature review. First, the research refers to regime theories from different schools – neoliberalism, realism, and constructionism and Young's study about roles of effectiveness

regime in order to identify the traditional regime. It's hard to estimate effectiveness in condition of non-regime, but instead, it'd be possible to comprehend necessary conditions for mitigating the conflict in traditional regime theory, and this research uses those Young's findings as standards to measure the possibility of traditional regime building by current countermeasures. Second, the interview and questionnaire survey aims to identify the current state of DSS countermeasures and perspective on problem of all-involved stakeholders. The interviewee covers DSS-involved four different countries- Korea, Japan, China and Mongolia, and four different affiliations including government, business, academia and NGO. In the vein of developing regional cooperation to create and execute practical DSS solution, as conclusion, this research argues that 1) only knowledge-based approach can explain the empirical observation of current regime formation process to address DSS mitigation, and that 2) the traditional approach to support environmental cooperation is not indispensable to vitalize the very key factor – consensual knowledge. That is, building a new model of regime is required for DSS problem-solving in Northeast Asia. These two conclusions refer to five representative results from interview and questionnaire survey, which are 1) Lack of problem awareness and low shared problem understanding level in regional level 2) Low interest of each state in common interest, 3) Concentration more on knowledge and its sharing than on economic factor, 4) Low awareness of existing initiatives, and 5) Tendency of all states to reluctant to regulatory system. In addition, the conclusion is also supported by the result concerning dispensability of traditional regime which is analyzed with the standard of Young's key roles of effectiveness regime. In the end, the research offers new challenge, a creation of 'community of interest network' embedding multiple-scaled key stakeholders including actors from not only government, but also from business, academia, non-government organization and public together into regime construction,

utilizing non state communities knowledge for building consensual knowledge and problem understanding, and encouraging deliberative and meaningful dialogue toward sustainability of Northeast Asia in more practical way.

Key words: Dust and Sand-Storm, Northeast Asia, Sustainability, Environmental Regime, Regime paradigm shift

ACKNOLWEDGEMENTS

No one walks alone on the journey of life. This research would not have been possible without support of many people. First, I would like to show my greatest appreciation to Prof. Yasuko Kameyama. She offered invaluable assistance and guidance. I also wish to express appreciation to co-supervisor, Prof. Makoto Yokohari. Both professors inspired me greatly to work in this project. Also, I would like to convey thanks to Ministry of Environment of Korea, Ministry of Environment of Japan, Korean Forestry Service, National Institute of Meteorological Research in Korea, UNESCAP sub-regional office for East and North-East Asia, Korean NGO Future Forest, Organization For Industrial, Spiritual and Cultural Advancement-International (OISCA) in Japan, Hanhwa Eco Institute in Korea, Japan Airline (JAL), Overseas Environmental Cooperation Center (OECC) in Japan, Chinese NGO Dalate Qi Kubuqi Earth Eco-Village, Institute of Meteorology and Hydrology in Mongolia who willingly helped me gather the necessary data and information. The guidance and support received from Dr. Batjargal Zamba and Prof. Chung Suhyong who contributed to this research were also great vital for the success of this research. I also want to thank you for support and kindness of Assistant Professor. Makiko Sekiyama, Assistant Professor. Tomohiro Akiyama, and all other faculty members of GPSS. I can’t say thank you enough to my family for their tremendous support and love. Without their encouragement, I cannot be here. Also, not forgetting to my friends who always been there for me. I want to express appreciation especially to my graduate friends who are sharing happiness and sadness together as well as knowledge. In this page, I take the opportunity to express my gratitude to all those people.

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBRIVIATIONS

ACE-ASIA	Aerosol Characterization Experiments in Asia
ADB	Asian Development Bank
CNEMC	Chinese National Environmental Monitoring Center
CSR	Corporate Social Responsibility
DSS	Dust and Sand-Storm
ESCAP	Economic and Social Commission for Asia and the Pacific
KFS	Korean Forestry Service
LRTAP	Long-Range Transboundary Air Pollution
MEP	Ministry of Environmental Protection
MOEJ	Ministry of Environment of Japan
MOEK	Ministry of Environment of Korea
NEAC	North-East Asia Conference on Environmental Cooperation
NEASPEC	North-East Asian Subregional Programme for Environmental Cooperation
NGO	Non-Governmental Organization

LIST OF ABBRIVIATIONS (continued)

NPO	Non-Profit Organization
OECC	Overseas Environmental Cooperation Center
SEPA	State Environment Protection Administration
SFA	State Forestry Agency
SOM	Senior Office Meeting
TDGM	Trilateral Director-Generals' Meeting
TEMM	Tripartite Environmental Ministry Meeting among Korea, China and Japan
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank
WMA	World Meteorological Administration
WSSD	World Summit on Sustainable Development

1. Introduction

1.1 Background: Dust and Sand Storm (DSS) in Northeast Asia

Nowadays, a vast literature has been dedicated to the sustainability issues and environment is one of the keys to consider sustainable development of the world. This article is written about one regional trans-boundary issue, Dust and Sand Storm (DSS), considering sustainability of regional ecosystem and human-life as well as that of cooperation of various problem-involved stakeholders toward problem solving. This paper concentrates on regime as the most possible mechanism to encourage such cooperative relationship.

Since the UN Stockholm Conference on the Human Environment in 1972, regime study has been received the considerable attention, and most of improvement has been found in certain issues, such as air and marine issues. Although in many there are diverse pace of progress on regime creation in environmental area, it has not been developed in Northeast Asia as rapid as other regions. In Northeast Asia, it is DSS which is one of the seriously considerable and controversial issues but have never been fully discussed for regime toward problem solving.

DSS has been called as diverse names over the world, such as Asian dust, yellow dust, Whangsa[1], Shaochenbao[2], and Kosa[3]. In Northeast Asia, massive DSS arises in arid and semi-arid areas in China and Mongolia such as Taklamakan and Gobi deserts and Loess Plateau, and it's prevailed into neighbor countries, Korea and Japan, mainly by westerlies in almost every spring. According to Chun (2000, p. 49), the observation records concerning DSS phenomenon are found out in a number of times, especially Korean historical writing of Korea Dynasty

[1] Korean
[2] Chinese
[3] Japanese

(918~1392), the Koryosa[4]. From this point of view, on one hand, it's been considered as natural phenomenon which is occurred by dry air, strong wind, and low precipitation, rather than human-induced environmental problem such as climate change and water pollution (e.g., Figure1). However, on the other hand, in terms of increase of its intensity and frequency, countries also concentrate on anthropogenic sources, especially overgrazing and over-cultivation, which put Northeast Asian ecosystem and human livelihood under growing pressure. Under such a non-consensual understanding of problem, the expectations on the way and result of problem-solving are also different. For states understanding DSS as natural phenomenon, problem-solving means damage mitigation. On the other hand, when considers DSS as human-induced problem, problem-solving can be defined as getting rid of problematic anthropogenic factors. In this manner, it would not be an exaggeration to say that such condition makes hard to constellate each actor's interest and lead common interest.

[4] See the historical record of Koryosa quoted from Chun Youngshin et al, The Yellow-Sand Phenomenon and Yellow Fog Recorded in the 「Koryosa」(2000),p.49.: "The Yellow-Sand Phenomena occurred during the period from 10C to 14C in Korea have been investigated using the historical record of the Koryosa. It is written as the "dust rain (土雨, 黃土雨)" or "mud" which means the falling down of dust from the sky."

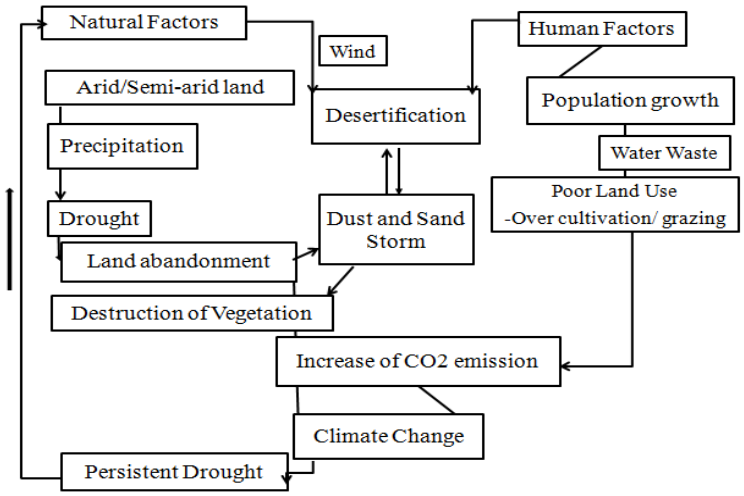

Figure1. Causal Factors of DSS

Source: Own figure based upon UNCCD documents and AIRIES (Association of International Research Initiatives for Environmental Studies) (2010, p.6.)

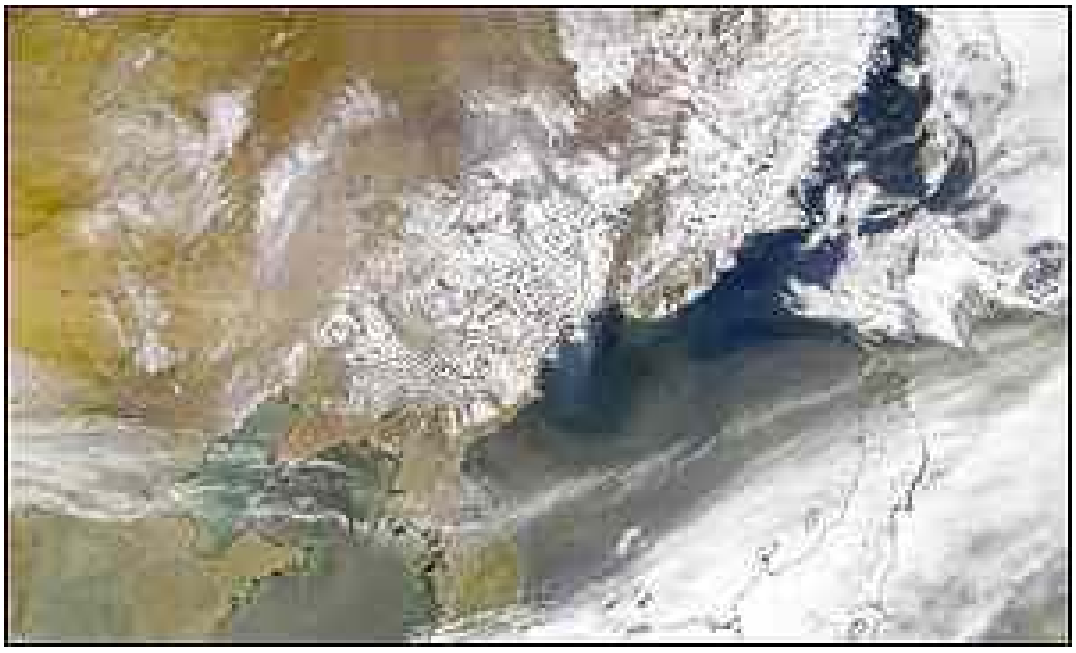

Figure 2. Satellite image of path of DSS from Mongolia and China to Korea and Japan

Source: map from NEASPEC material (2005)

Considering DSS occurrence and its difficulty to promote the cooperation by existing countermeasures, therefore, the question is called into effectiveness of traditional regime in DSS problem-solving. In order to avoid larger scaled negative effects of DSS and mitigate its damage level, the voices about building institutionalized regime have become stronger, and process toward regime creation has been continued. Among relevant countries in Northeast Asia – Korea, Japan, China and Mongolia- have made efforts to deal with it, and a number of discussion channels in multilateral level – such as Tripartite Environment Ministers Meeting among Korea, China and Japan (TEMM) and North-East Asian Sub-regional Programme for Environmental cooperation (NEASPEC) - have been grown up. A glance at current state of countermeasures addressing DSS control are nevertheless not remarkable so far, especially in terms of practical efficiency to amend gap of political system and unbalanced capability of finance and technology among involved-countries. In dealing with such limitations on this issue, this study will endeavor to analyze the possibility of problem solving by current efforts and investigate the design adequacy of currently considered goal of regime.

Before looking into the body of this research, this chapter will introduce general feature of the whole study by showing 1) Background of problem (Dust and Sand Storm problem in Northeast Asia), 2) Research questions and objective, 3) Hypothesis, 4) Research trend and literature review, and 5) Map of the whole research.

1.2 Research Questions and the Research Objectives

My research emerged from a question: “Why regimes are created in certain region for certain problematic issue, but has not been able to create in Northeast Asia for DSS mitigation?” In the absence of a global government, states start to need a governance structure to control each

like-minded stakeholder's behavior, prevent the conflict and promote the cooperation to deal with transboundary problems. It is regime that has been established to fill the requirements. Studies in the field of regime have identified key regime-formative factors –such as power, interest and knowledge (E. Hass 1980; P. Hass 1983; Keohane 1984; Young 1999). It is based on the idea that regime doesn't be created automatically after the problem is found out. Even after demand of problem-solving is found out, the demand is merely starting point, and how to constellate the interests among all different stakeholders is important point. According to Chayes and Chayes (1993, p.179), a state needs not enter into a treaty that doesn't conform to its interests. Even when faced with trans-boundary environmental problem, states are not obliged to cooperate in general. States tend not to do an activity without obvious guarantee having their own self-interests. Then, one research question arises: "What is the biggest obstacle to promote the cooperation among all-involved actors to solve DSS problem?" In order to answer for the question, several sub-questions should be pointed out: "How well have problem awareness and shared problem understanding been promoted by current countermeasures?", "Through participating the regional cooperation to solve DSS problem, how much and what kind of benefits can expect to be gained in terms of political, economic, and ecological perspectives?" "How those problem-solving activities affect national development?" In addition, given increasing interest in scientific knowledge in the study field regarding environmental regime,[5] few more specific questions concerning knowledge can be mentioned: "In what direction does each country has done the scientific investigation concerning DSS problem?", "What kind of monitoring tool has been used and how to analyze the data?" These questions aim not only to look what kinds of DSS research system have been made in each member country, but also to

[5] See P.M. Hass (1989), E.B.Hass (1993), Lidskog and Sundqvist (2002), for more insight of scientific knowledge as a factor of environmental regime.

inspect how unified they are. Then, it will also be possible to understand how much extent knowledge-sharing and communized problem awareness among all-involved countries have been built.

In addition to the first question above, there are other curiosities to be answered: Do existing countermeasures make a process on problem solving? That is, the research has a question on effectiveness of current process toward regime creation. Regime creation has been discussed predominantly in some issue area especially in western society, but it's seldom to be tested under non-western circumstances. As an instance, regime on Long-Range Transboundary Air Pollution (LRTAP) which was created in 1979 to mitigate transboundary damages from acid rain in Europe is one of the widely discussed topics as a successful case (Lidskog & Sundqvist, 2002; Wilkening 2004), and after that, Agenda 21 states that (Europe's) experience needs to be shared with other problems of the world (UNEP 2004). However, this doesn't imply that every regime formation process will converge with the precedent model. Takahashi (2000 p.114) stated that institutional arrangements will not always mirror those of Europe. In this manner, the questions whether the existing model of regime is suitable for being applied to DSS case in Northeast Asia and what is key factor for regime creation addressing DSS problem control are raised. Previous researches on this issue argue that it is mainly because of regional difference based on the regionalism (Takahashi 2000 pp.97-117). In addition, in order to find out the most probable concept of regime to activate the key factor and to promote the sustainability in the end, it is highly meaningful to consider sub-questions below: 1) Is it reliable to encourage the legally-binding regulatory system in Northeast Asia? 2) Is current state government-centric activity sufficient to mitigate DSS problem? 3) How important role does other actors take?

In sum, this research has two representative questions which have a number of incidental questions to be answered: “What is the biggest obstacle to create a regime for DSS problem-solving?” and “In order to activate the key factor and solve the DSS problem in Northeast Asia, do existing countermeasures take a role to be a regime? Does such approach need to be changed?”

Thus, this research aims to combine existing field knowledge and expertise with a theoretically guided regime formation. In the area of regime study, the hypotheses about effectiveness of environmental cooperation between states have been developed and significance of regime on environmental issues has been pointed out for more than 30 years now (Litta 2012, p.18). Drawing on a wealth of historical literature, it can be figured out that such hypothesis about regime creation and its effectiveness is generalized to a large extent. However, the generated idea has mostly based on the context of western society. Therefore, this research aims to identify the key factor to solve the problem of DSS and to verify the indispensability of regime formation by making use of traditional theory and applying it to non-western society, Northeast Asia, to address issue of DSS problem. Takahashi (2000) has similar premises. In her study, while focusing on acid rain problem in main, she insisted that when considering the potential for the formation of a regime addressing transboundary environmental problem control, it’s necessary to examine the essence of environmental regionalism observed in each region and sub-region, in order to consider regional variation. In addition, not only regional difference, but the problem characteristic itself is also considerable to construct new model. Desombre (2005, pp.75-88) mentioned the problem type as one of the significant factors for evolving the environmental cooperation. According to her, the types of environmental issues have changed over time, and the structure of environmental cooperation needs to change with the trend of issue change. In this manner, this research aims to identify specific key factor to create regime for DSS

problem in Northeast Asia, and to suggest the need to rethink the concept of environmental regime. Joyner argued that the key for managing global environmental problem lies not in the formation of sufficient rules or attract the state parties in to the legally binding system, and governments should have willingness to comply with regime rather than being forced (2005, pp.89-120). In 2002, World Summit of Sustainable Development (WSSD) at Johannesburg also stated the significance of fostering transnational and multi-sectored partnership general state-centered goal to establish the goal of problem solving (UN DESA, 2002). Also, possibility of forming new type of policy networks with business and other non-state actors toward the pragmatic responses to global problem is mentioned by Yoshimatsu (2010). Another study by Abott and Snidal (2008) presents the term of 'triangular framework' involving different combinations of states, private companies and Non-Governmental Organizations (NGOs) to challenge the traditional state regulatory system.

1.3 Hypothesis

On the basis of two main research questions which were mentioned above, this research has two hypotheses as considerable answers for each of them. First, for the first question about the significant element dealing with regime creation, it assumes that it would be consensual knowledge which takes priority rather than political power and interest which are generalized as key factors for regime creation. It's based on the idea that both political and economic benefits of involved-actors (states) have a low correlation with DSS problem-solving, and it is largely because DSS is resulted not only from the industrialization but also or even more from natural factors and historical pattern of poor land/forest/water use. Brettell (2007, p.99) said that even DSS-affected countries cannot easily shift the blame or responsibility on others to recover the problematic situation because of those reasons. On the assumption, one issue remaining to

encourage each stakeholder's cooperation is cognitive gap toward DSS problem, and a knowledge-based approach is significant to close such difference and to build the regime. The significance of knowledge which brings about problem awareness has been addressed as a mean to lead to attempts to deal with negative both internal and external effects, such as treaties for straddling fish stock problem solving (Ward 2006, p.155). Second, this research argues that shift of regime paradigm is necessary to deal with DSS problem in Northeast Asia. In terms of DSS issue, new concept of regime which is based on voluntary approach rather than concrete and structural way, and driven not only by state power, but also by non-state actors, such as scientists, NGOs, and international organizations is highly possible instead of institutionalized and regulatory regime. Also, it assumes that such voluntarily constructed and by-multi-stakeholder built regime makes a positive impact on satisfying the needs of key factor to solve the problem - consensual and trustful knowledge. It doesn't mean that state cannot make any contribution to problem-solving. State has been considered as key actor to control transboundary problems which related with various demands of various stakeholders. However, this research assumes that it needs to have new approach encouraging regional cooperation for DSS problem mitigation, instead of merely relying on core role of state as usual. In the end, beyond the closed and traditional management theory which mainly considers decision-making of the powerful state bureaucracies and cannot provide an adequate framework for DSS problem-solving in Northeast Asia, the research will identify more recent and probable regime theory which allows for the evolving nature of relationship among diverse stakeholders and non-regulatory framework for future sustainability.

1.4 Research Trend and Literature Review

I argue that question of regime possibility to solve DSS problem in Northeast Asia has not been dealt with appropriately so far. Therefore, this page will start by an attempt to arrange the researches which have been done in this field, and will introduce an aim and originality of this research.

There is abundant literature on DSS issue, and these are classified into three different publication types that explain the current state of DSS problem. First, in Northeast Asia, researches for identifying the problem of DSS have been carried out mainly in scientific area. It finds natural and anthropogenic causes of problem occurrence and development in source area, and analyzes the state of damage level in other countries as well as source area (Samsung Corp 1997; Kwon 2002; Zhang et al. 2003; Korea Civil Aviation Development Association 2003; Rural development administration 2003; Yu 2008; Kimura 2012). Under having an interest in same problem, however, each country has focused on different issues. In case of Korea, the research focuses mainly on 4 issues; physical and chemical characteristic (National Institute of Environmental Research 1989-1991; Rural Development Administration 2003; Lee and Kim 2008), DSS occurrence and movement route (Kim, Lee, Moon and Song 2001; Kim 2007-2008; Kim 2010), damage level analysis (Kwon, 2002; Kim et al, 2003; Rural development administration, 2003;) and efficient solution for DSS mitigation (Lee 2002-2005; Chun 2004-2006; Lim 2006). Japan has concerned about DSS occurrence and trans-boundary movement mechanism since mid-1990s. Since 1999, researches about DSS in Northeast Asia and analyses on aerosol in the climate have been carried out with the cooperation of International joint Monitoring Project, Aerosol Characterization Experiment - Asia (ACE-ASIA) (Iwasaka et al 2003; Matsumoto, 2003). Also, the Ministry of Environment (MOE) in Japan has implemented the research to understand DSS inflow on various parts of its country and its atmospheric

components (MOE 2009). China, as a DSS source and damaged country, concerns on its occurrence, transport route and forecasting system (Ci 2001; Yu 2008; Lu and Wang 2011). Not only the country-by-country difference of the major topic even regarding same issue of DSS, but there is another finding from this literature review. In many studies tend to focus on the issue of desertification rather than DSS itself. Especially in case of China, DSS has been mainly dealt as a meteorological issue and the study is mainly done by Chinese meteorological center. Forestry service affiliated research institute and Chinese State Environmental Protection Administration (SEPA) have also made a contribution to identifying the nature of DSS, but they tend to consider it as a by-product of desertification. Therefore, such scientific knowledge is hard to be sure that whether it reaches the level of consensual knowledge over the territory at this moment.

Second, another type of literatures is policy-oriented and atheoretical. Various governmental and international organizations from each DSS-related country and from abroad publish reports on the state of environmental problem and current countermeasures (CCICCD 2000; KEI 2003, 2004; ADB 2005; MOEJ 2005; MOEK 2006, 2007; IGES 2009; NEASPEC 2012; WMO 2012). All these reports, however, do not offer theoretically informed insights on regime formation. In general, they can only serve as an information update, and contribute explaining shortcomings of environmental protection[6]

Third, however, reviewing previous studies about traditional management system has limitation to consider non-regime situation, such like Northeast Asia. In this manner, researchers refer to an institutional failure of the respective institutions and initiatives that have been created

[6] In order to understand concept of regime, this research needs to review a number of literatures concerning regime of diverse scholars (Krasner 1982; P. Hass 1983, Keohane 1984; Young 1999; Litta 2012). According to Cheon's book about international environmental cooperation, it's possible to understand various concept of regime concerning environmental issue especially (1995).

or assigned to solve the problem in Northeast Asia and identify the reason of non-regime[7] situation in this region, through using comparative analysis between Europe and Asian case. Paper written by Mahoney and Snyder (1999) stated that the ideas of rethinking existing agency and structure of regime and movements toward the political regime change have been evolved increasingly.[8] Suzanne, Dexter, & Andew (2009) addressed that we need to develop new approaches to managing environmental problems, which is different from traditional management system which focuses on powerful bureaucracies the most. Here, in the case of DSS, lack of central entity as a hub for the network and different interests of the countries are analyzed (Won 2003; Chung 2005; Lee & Jho 2009). Based on such findings from literature review, therefore, this research aims to set the backdrops to the considerations of environmental regime building raised originally by previous regime studies, to suggest the necessary considerations of new concept of regime which is more appropriate to mitigate DSS problem and to promote sustainability.

1.5 Map of argument and Outline

First, the pressing urgency of trans-boundary DSS problem in Northeast Asia is outlined in Chapter 1 as an introduction. Introduction includes background of DSS problem in Northeast Asia, research question, hypothesis, trend of studies on DSS issue and objectives, and the outline of whole research. It aims to understand the problematic situation and explain general idea of this research.

[7] A typology of non-regime has started to be used in Dimitrov's research, International Nonregimes: A Research Agenda (2007, pp. 230-258). According to him, its concept has been based on a curiosity why are multilateral institutions absent from some areas of international relations, and the study contributes expanding regime theory.

[8] See also Kitschelt (1992), for more insight of political regime change.

With understanding about background in Chapter 1, thoughts and arguments of this research will be derived from regime theory. First part of Chapter 2 will be consisted of definition, function, and type of regime, and will deliver an explanation about key factors of regime creation. Also, this chapter includes the introduction of countermeasures concerning DSS issue. All DSS-involved countries in this region are engaged in national, bilateral and multilateral countermeasures. This means that they appreciate efforts of joint problem-solving, though there is no successful result so far. These two points show the current regime formation processes, and applying theories to the reality may contribute to explain possibility of regime creation.

Methodological questions will be addressed in Chapter 3. This research will answers the queries and measure the hypothesis by clarifying correlation between DSS problem solving and political and economic benefits of actors (states), level of problem awareness and efficiency of current countermeasures through questionnaire and interview with key stakeholders in all-involved countries as well as literature research. Prior to data analysis from these methodologies, explanation about questionnaire construction, interviewee and difficulties which I met during the survey is necessary to be mentioned. To define effectiveness of the methodology, standard of interviewee selection and regime effectiveness analysis tool introduced by Young will be described.

After that, Chapter 4 deals with the result of data analysis and discuss the comprehensive results from this research. Qualitative data analysis will be shown with country-to-country basis, since sovereign state is the only possible member of regime in existing theory. The result measures the reliability of the hypotheses and answers the research questions – one is related with key factor for DSS regime building and the other involves the idea of the shift of traditional

regime paradigm for practical problem-solving. Finally, the last chapter will review research questions and aim, and discuss the conclusion. Also, in conclusion, it will discuss the limitation of typical features of regime in Northeast Asia and distill the key factors for DSS regime creation in Northeast Asia to enable reflection on the underlying question of regime creation.

2. Possibility of Regime Formation

2.1.Regime

Common problems require the collective action. Appearance of transboundary environmental threats has awarded global environmental politics one of the major statuses in the world concern. Since byproducts of economic growth have made a serious impact on human health and even economic well-being over the national boundaries, the growing trend of international concern on environmental issues and emergence of joint/collective countermeasures is inevitable result. Among different approaches to solve such problems, it has been relatively common to establish regime under the heading of international cooperation in state level. Regime study is an area concerning what kind of mechanisms states have established for themselves in order to reach collective goals (Stein 1982; Keohane 1984). As a respond to mounting international concern about environmental threats, as I mentioned in previous sentence, environmental regime analysis has been also evolved since 1970s (Krasner 1982; P. Hass 1983; Keohane 1984; Young 1999; Litta 2012). In this chapter, I will explain the concept of regime and its importance in Northeast Asia to solve Dust and Sand Storm problem.

2.1.1. Definition and Function

As one of the most well-known regime definition, Krasner describes (1982, p.186) regime a set of principles, norms, rules and decision making procedure around which actor expectations converge in a given issue area, though the definition of regime is different depending on schools and scholars. Instead of this broad concept of regime, as an example, Pamela focused on second definition, a system of principles, norms, rules, operating procedures, and institutions that actors create or accept to regulate and coordinate action in a particular issue

area of international relations (2006, p.17). According to Haggard and Simmons (1987, p.495), it is an example of cooperative behavior facilitate cooperation, and Mayer and Rittberger defined it as a major type of international institution. The basic assumption is common, however, which are that behavior of international system is being increasingly institutionalized, and that the international institution means “the rules that govern the elements of world politics and the organizations that help implement those rules” (Bernauer 1995, p.351). In this sense, regime is expected to facilitate finding a solution for collective problems by creating shared expectations about responsible behavior and increasing level of transparency for each member state (Hasenclever et al 2000, p.3).

2.1.2. Type

The type of regime can be classified into two groups in large; one of them is organization type –such as World Meteorological Administration (WMA), United Nations (UN), and Association of South East Asian Nations (ASEAN) - and the other one is type of rules and regulation without existing visible body- such as Kyoto regime or treaty. Either way, most regimes take the form of legally-binding agreement or instrument. One of the most common examples of the legal instrument is a convention. Since the sovereign state is the only member of regime according to the existing regime theory, the convention contains binding obligations to rule the actions of state. Second, framework convention is another considerable pattern. It is established when a convention needs to have more subsequent elaborating texts to be negotiated, and is usually followed by more than one protocol. Convention of Long-Range Transboundary Air Pollution (LRTAP) is an example, which is one of the most widely-publicized successful regimes to control regional conflict on environmental problem. Through the framework convention, it is possible to expect to have a set of principles, norms and goals rather than having

legally binding obligations from the beginning (Pamela et al. 2006, p. 20). Third, a non-binding agreement has also been viewed as one type of regime in recent (Pamela et al. 2006, p.20). Although grand concerns on international issues such as trans-boundary air pollution and global warming tend to be addressed legally, regime extends its scope from traditional hard law zone to soft law area in an effort to consider effectiveness.

2.1.3. Theoretical Approaches to regime 1: Formative Factors of regime formation

Regime addressing global environmental problems has been widely negotiated with the increase of concerns on transboundary environmental issues. However, it doesn't mean that every state has high willingness to engage in binding arrangements. According to Oslon (1998), self-interest and rational state actors may expect to free-ride on institutional successes without paying any price for implementation of problem-solving activities or taking responsibility for their fault. However, even under this situation, there are several successfully-built regime cases, and the research on regime creation has found out the answers for the question: Under what conditions regime arise? (Keohane 1982; Krasner 1982; P.Haas 1989; Young 1999) This part will explain three major driving conditions to generate international regime, which are based on three different theoretical approaches – Realistic, Neoliberalistic, and Cognitivistic approach – in the area of International Relations.

First, the factor of power can be viewed as one key element. In other words, it can be determined as a political leadership of hegemonic states. Although the role of non-stake actors in global environmental issues has been grown up (Pamela et al. 2006), states are still the main actor in regime theory. Only states can create regime and be its member. Krasner (1982) determines it in two different approaches; one of them is cosmopolitan and instrumental, and the

other one is particularistic and potentially consummatory approach. On one hand, from the formal approach, regime is a result of hegemonic power's policies in the service of public goods. That is, it's used to promote joint maximization for every participant. On the other hand, in the latter discrimination, regime is used to enhance the specific states' profit over other states by stressing coercive power. Here, in the area of transboundary environmental problem, it is formal one which gives an explanation of the factor of power for regime creation.

Second, the egoistic interest of each participating state is significant. Keohane's 'After Hegemony (1984) focuses on an economic demand for the regime creation rather than the power of hegemons, based on the assumption that every state gives priority to their own national interests. Once the advantage of a regime to solve the problem and the fact that it's connected with national interest by cutting the cost and increasing gains for all parties is clarified, each participant has no reason to hesitate to create regime.

A third key factor of regime creation is the epistemic communities' model, which emphasizes the significances of shared knowledge and transnational network of experts and policy-makers, based on scientific researchers on given issue. The importance of scientific evidence in the politics of global environmental issues is stood out as a mean to detect the root of problem as well as understand the problem itself. In addition, this factor can be considered as a source of interest. Shared knowledge with scientific evidence can solve the problem of high levels of uncertainty and high transaction costs (Keohane 1982), and then it brings the result of better liability for actions of parties. By P. Hass (1989), the concept of transnational epistemic communities also starts to be focused as a community of experts sharing common values and approaches to policy problems.

Thus, these three key factors for regime building accounts for historical pattern of regime formation. However, it doesn't necessarily mean that this theory is suitable for every problem which the world faces on in current. Therefore, in the next chapter, the research will examine that Northeast Asia can trace the footsteps of the traditional regime model, that is regime possibility, through the process of DSS countermeasures-understanding based on the literature review.

2.1.4. Theoretical Approaches to regime 2: Effectiveness of regime

Before looking more closely at the possibility of regime creation in Northeast Asia, there is one more theoretical consideration need to be pointed out – regime effectiveness. Although the definition of effectiveness is diverse, the study on regime effectiveness has been discussed by a number of scholars with other relative issues such as regime creation and change (Young 1992, 1999; Underdal 2000). Young (1999, pp. 22-28) sets 6 roles of effective environmental regime, and measures the effectiveness of certain regime by analyzing whether the regime is doing those rules sufficiently or not (e.g., Table 1). [9] There is no visible regime and no result from regime creation to be examined in current Northeast Asia, but it would be useful to use such roles as criteria to measure whether existing initiatives meet the needs for being effective regime.

[9] In International relations, the area of regime study has expanded from the topic of its creation to its effectiveness, and the regime without effectiveness evaluation is meaningless. Despite of the absence of obvious regime in current Northeast Asia, it is highly meaningful to consider possibility of effective regime creation, and this research concentrate on qualitative analysis made by Young. Although there is another method of analysis made by Underdal, focusing on quantitative aspect, there are a number of unexpected values creating regime. Young stated that regime is a result of interaction of diverse values such as change of political conditions as well as that of environment in all involved-countries, and concerned that stereotyping such a various factors by one quantitative measure produces a misunderstanding and distortion in reality.

Role of Regime	Explanation
Utility Modifier	Whether the perception of each actor for the interest can be changed?
Enhancers of Cooperation	Whether conflict among diverse stakeholders is mitigated and the cooperation is encouraged?
Learning Facilitators	Whether the sufficient problem awareness is raised and shared among stakeholders, and does cost-efficient countermeasure built upon by updating scientific evidence?
Bestowers of Authority	Whether participants accept the authority of regime and follow the rule which is designated by regime?
Agents of Internal Realignments	Whether participants' behaviors or problem awareness are changed and the institutional arrangement is developed via the regime creation?
Role Definers	Whether the regime distributes the role of each participant keeping pace with the change of situation?

Table 1. Roles of Regime

Source: materials from Young (1999, pp. 22-28)

According to Table 1, there are 6 criteria to become an effective environmental regime: 1) Role as Utility Modifiers: This emphasizes the significance of perception change of each actor. Based on the general assumption in the field of international environmental regime, each actor demands individual interest rather than common interest such as environmental improvement. In order to provide cooperation, perception of each actor for the common interest should be increased. 2) Role as Enhancers of Cooperation: Even after finding serious problem such as environmental degradation, it is hard to expect each country's behavior is changed in cooperative way in a sudden. Considering various obstacles such as gap of political situation and lack of

trustful data, regime efficiency can be evaluated by verifying whether conflict among diverse stakeholders is mitigated and the cooperation is encouraged. 3) Role of Learning Facilitator: It's concerned the economic efficiency as a result of regime creation. It's based on assumption that cost-efficient countermeasure can be built upon when sufficient problem awareness is raised and is shared among stakeholders via the regime. 4) Role as Bestowers of Authority: The regime as Bestowers of authority concerns whether actors accept the authority of the regime and follow the rule which is designated by the regime. In the sense that efficiency can be measured by visible change of actors, it is possible to find the relationship between 4) and 5). 5) Role as Agents of Internal Realignments: This role also explains that regime aims to identify whether participants' behavior or problem awareness is changed and the institutional arrangement is developed via the regime creation. At last, 6) Role as Role Definers: It takes a role of distributing appropriate role to each participant keeping pace with the change of situation.

2.2.Regime Creation addressing DSS control in Northeast Asia

2.2.1. Current countermeasures: National, Bilateral, and Multilateral level

Efforts to solve DSS which not only has affected the country of origin, China and Mongolia, but also other neighbor countries such as Korea and Japan, have been appeared in various levels from national to regional level. National efforts has begun since early 90s in Mongolia, which is followed by China, and the other two, Korea and Japan, also starts to engage the problem-solving efforts since 2000, after one of the biggest DSS made a serious damage on their own countries (e.g.,Table 2.).

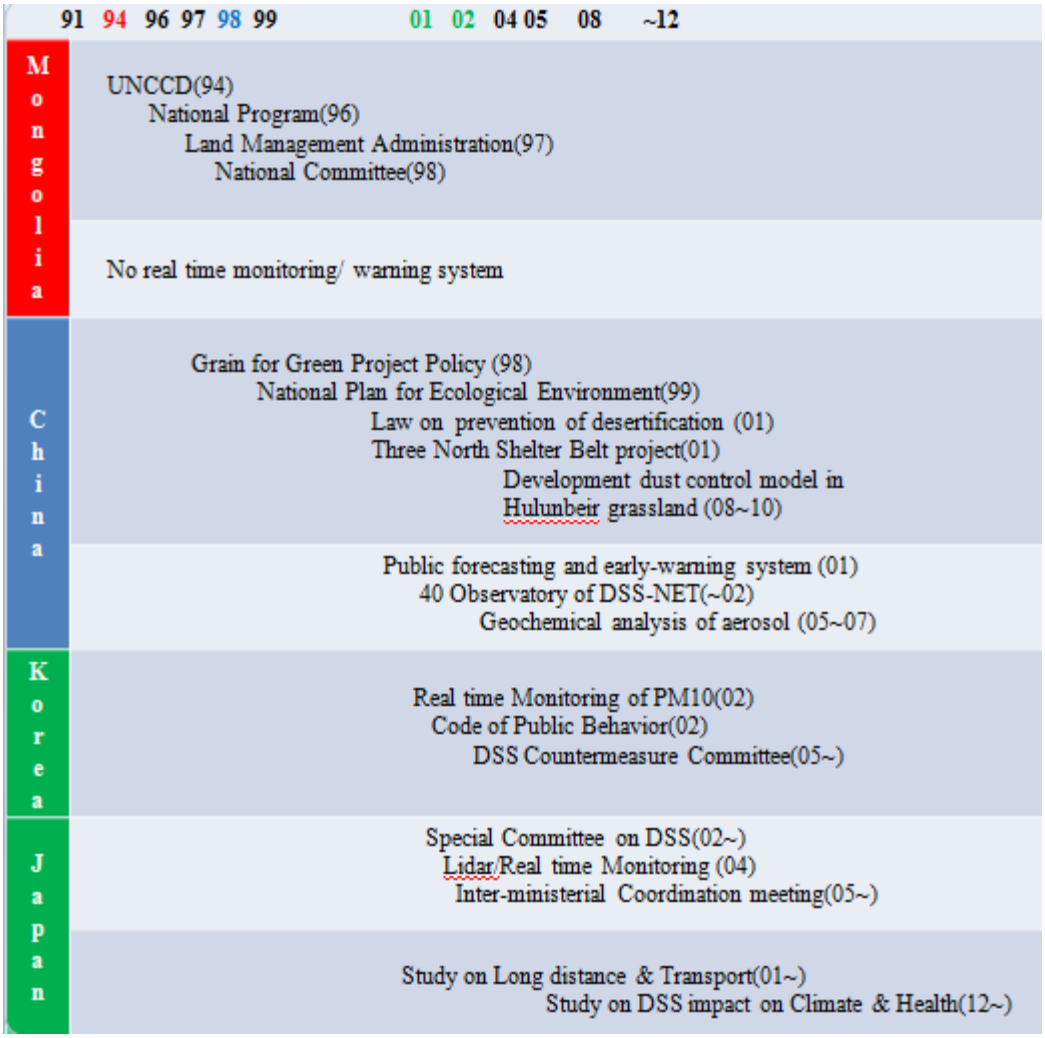

Table 2. National DSS-Countermeasures

Note: Table shows that 1) each country's countermeasure dealing with DSS problem has been started in different time line, and that 2) major focuses are different depending on whether the country is included in problem-source area or rather closed to damaged area. In case of Mongolia, in spite of its early pace of problem-solving activity, the beginning of settlement of DSS treatment depended on whether international organization has interest in problem, rather than its own willingness, largely because of lack of financial and technological capacity. Therefore, a Convention on Combat Desertification (UNCCD) which was signed in 1994 as a result of problem understanding can be considered as a trigger of Mongolian treatment dealing with DSS problem. Source: Website of Ministry of Environment of Korea (MOEK); Ministry of Environment of Japan (MOEJ); Governing council's report of UNEP (2004); Chinese Research Academy of Environmental Sciences (CRAES)

As a national countermeasure, Chinese government has accelerated a number of DSS mitigating projects in domestic level, expanding investment in environmental security as well as economic development. Since 1988, Chinese State Forestry Administration established the Grain for Green Project Policy, People's Republic of China government has implemented grazing bans and several national plans for ecological environment. Among increasing number of afforestation and grassland restoration programs in China, it's marked by 'Three North (Northeast, North and Northwest China) Shelterbelt program in 2001. This program, which is also called as Great Green Wall, has brought the successful result of forestry recovery of 'Three North' area from 5.05% of the late 1970s to 6.06% (Qi Lu and Sen Wang 2003). However, the efficacy of these domestic programs to mitigate DSS problem was questionable. In China, a ten-year program with a total investment of 54 billion yuan to relocate the nomadic heritage and mitigate DSS problem in northern China especially was approved, but, unfortunately, it's not solved the problem and brought another issue in the end. The program relocated the herders to the outskirts of central city area, but livestock graze in scale of year-round instead of seasonably before implementation of the policy. The grazing bans made a negative impact on native nomadic tradition and criticized in several researches (Brettel 2007, p. 100).

These kinds of problems led by settlement and relocation policies targeting nomadic people could also be found in Mongolia. Additionally, in Mongolia, there was another big obstacles which is limited capability in terms of financial and technically, producing the result of lack of good data base. Although the meteorological observation system has been developed and expanded since 1936, according to UNEP's report (2004), meteorological technology of using data for DSS monitoring remained in developing stage for quite a long period. It was 2006 that Mongolia became feasible to get DSS data, by gaining technical support from JICA in 2006

(Hand, JICA report). On the other hand, Korea and Japan have concentrated on monitoring and forecasting system development for early warning, but it's not a long-term solution of the problem. Therefore, this chapter explores the regime formation process and possibility of regime creation in Northeast Asia through reviewing DSS countermeasures in regional level which have been made.

Under these circumstances, regional bilateral and multilateral cooperation on DSS problem started appearing gradually. First, bilateral cooperation including both governmental and non-governmental activities between Korea- Mongolia, Korea- China, Japan-Mongolia, and Japan-China. Between Japan and China, a treaty for cooperation on environmental problems was created in 1994, for the first time. Since mid 1990s, Japan has helped development of Chinese monitoring system through the joint monitoring in Niigata, Japan (1998~), in Dunhunag and Taklamakan since 2000. Also, not only Japan, but Korean support to China has also started since 2001, via the planting program between 2001 and 2005 in the first place, and Korean Forestry Service (KFS) implemented another reforestation project in Kubuqi desert between 2006 and 2010. The bilateral projects have also been grown in monitoring aspect as well as reforestation. Dr. Chun from Korean meteorological institution began to work on DSS trajectory model (HTM) and concentration model (HCM) to predict the behavior of DSS in better way, and it's proceeded to establish a joint monitoring network between Korea and China in 2003 (Chun et al, 2001).

In terms of bilateral program with Mongolia, it's more closed to "aid" rather than cooperation activity between two countries, Japan has been concentrated on technical cooperation for developing meteorological monitoring and forecasting system, and training experts as human resources, mainly by Ministry of Environment and Ministry of foreign affairs JICA. In case of cooperative activity between Korea and Mongolia, it's been started since 1996,

when a cooperative forestry plan entered into contract. After that, joint research concerning DSS problem has also started since 2000, under bilateral environmental agreement between these two countries. One of the most highly valued projects is the Greenbelt plantation project which is started in 2007 and still ongoing. Korean government has supported this anti-desertification and DSS mitigation efforts in a number of ways including feasibility study for first year's result, experts' training program and dispatch, and promotional efforts via the host of international symposium.

China	Korea	•Plantation Project in Western China (01-05) •Project for establishment of joint monitoring network (03-05) •Project for extended establishment of joint monitoring network (06-11) •Reforestation Project in Kubuqi Desert(06-10) •Small Scale A/R CDM Pilot Project (10)
	Japan	•Technical cooperation (including research project) : Forest Protection/Development Research Project : Aeolian Dust Experiment on Climate Impact research project (00-05) : DSS monitoring network establishment (01-) •Joint study on DSS outbreak & transport mechanism(96-00) on DSS movement and environmental impact of aerosol(01-03) •Financial support for meteorological center & network establishment(06) •Assistance for Grass-root project: afforestation project in Tianshui (2004)
Mongolia	Korea	•Greenbelt Plantation Project in Mongolia (07~16) •The Shoroon Shuurga-Hwangsa Project (06-) on meteorological administration : DSS joint research project 1 (07-09) : DSS joint research project 2 (10-14)
	Japan	•Technical cooperation (for meteorological survey/ weather advisory/ observatory network building etc) • Training the expert for meteorological data analysis) • Development investment and Yen loan

Table 3. DSS countermeasure in bilateral level

Source: material from documents by Korean Ministry of Environment, Japanese Ministry of Environment, interview, and Hand (2009)

Among regional cooperation network which is composed of multilayered channels, there is not only bilateral, but also multilateral cooperation – such as NEASEPC and TEMM[10] (e.g., Table 4).

Name	Participants	Contents	Funding
TDGM (TEMM)	Korea, Japan, China + 1 (Mongolia)	-Joint Research Group / Committee (2007) -Working group1 : Monitoring, Forecasting -Working group2 : Damage mitigation - Joint Management of homepage - Information sharing program	ADB-GEF
NEASPEC	Korea, N.Korea, China, Japan, Russia, Mongolia + International Organizations (UNESCAP, UNEP, ADB, UNCCD)	- Development and Implementation of Master Plan on prevention and control of DSS (2003-2005) - Technical Workshop, Training - Monitoring and collecting data - Project on Mitigation of DSS (2010-2011)	Core fund, ADB

Table 4. DSS-related countermeasures in multilateral level

Source: materials from NEASPEC documents (2011), website http://www.temm.org/

First, NEASPEC is regional governmental network, consisting of 6 countries within Northeast Asia region – such as Korea, North Korea, China, Japan, Mongolia and Russia, and International organizations – ESCAP, ADB, UNEP, UNDP, WB, and it aims to build a legally-

[10] According to literature review, three other multilateral-leveled cooperative network concerning on DSS problem were also found such as NEAC (North-East Asia Conference on Environmental Cooperation), ECO-ASIA, and NEAFN (North-East Asia Forest Network). Despite of these existences in literatures, according to the result of questionnaire survey, it were two initiatives – NEASPEC and TEMM that current stakeholders are recognized the most as the initiatives which are directly connected with DSS problem in Northeast Asia.

binding entity for preserving comprehensive environment in Northeast Asia. The ministry of foreign affairs of Korea has done a role of leader, and international organization such as UNESCAP, ADB, WB, and national countries of Korea and Japan have offered financial support in main. It's been established in 1993, and decided to embark on a project to facilitate cooperation for DSS preventing in origin sources during its 14th Senior Office Meeting (SOM014 2009) and set a detailed plan in 2010. As a follow-up of DSS-addressing project by ADB-GEF programs for DSS early-warning system building and pilot project implementation in problem origin countries in 2005, it has expanded their working scale in a comprehensive manner from implementation of pilot project in origin to encouragement of policy and technical experience sharing between China and Mongolia.

Second, as one of the major projects of TEMM (Tripartite Environmental Ministers' Meeting among Korea, Japan, and China), the three countries decided to launch TDGM (Tripartite Director General Meeting) on Dust and Sand Storm and DSS joint research group during its 9th meeting in 2007. Under the offer of government of Korea about regional cooperation building dealing with DSS problem, the 3 member countries agreed to have two working groups having different target each other. In order to have better efficiency, Mongolia is also participating the meeting of working group as an observer.

Meeting	Year	Place	Contents
TDGM1	07	Ulsan, Korea	DSS Joint Research Group Construction
TDGM2	07	Tokyo, Japan	Committee's TOR(Terms Of Reference) establishment
SCM1	08	Tokyo, Japan	1st DSS joint research committee meeting
WGM1	08	Seoul, Korea	1st DSS working group 1 &2 meeting
TDGM3	08	Seoul, Korea	2nd committee meeting – Official launch of Working group 1&2
SCM3	09	Beijing, China	3rd committee meeting
TDGM4	09	Chingdao, China	Joint research target review
WGM2	09	Tokyo, Japan	2nd Working group meeting
TDGM5	10	Sapporo,Japan	5th Director General level Meeting
SM4	10	Tokyo, Japan	4th committee meeting
WGM3	10	Jeju,Korea	3rd Working group meeting

Table 5. Tripartite Environmental Ministries' Meeting on DSS

Source: materials from website http://www.temm.org/

2.2.2. Assumption: Hypothesis of regime creation

This research is started from a curiosity about possibility and indispensability of regime formation to promote DSS solution. Why Northeast Asia has not been able to create a regional regime concerning DSS problem? Traditional regime theory said that community of interest among different stakeholders is a key to create cooperative regime. If each stakeholder concerns on common interest for all-involved states rather than their own benefits, it would be assumable that a DSS regime can be created. However, since such expectation is hard to be realized and current initiatives cannot take a sufficient role to encourage the consensus among different stakeholders, this paper hypothesizes that no regime condition has been and will be continued under traditional theory.

Therefore, I argue that Northeast Asia regime addressing DSS control should be approached in different way from what the traditional theory insists. Over past four decades, legally-binding regulation has been considered as one of the most unquestionably necessary mechanism for management of transboundary environmental issues, but this article offers a question: Is the creation of such regulatory regime really sufficient to control DSS problem in Northeast Asia? Following this curiosity, the paper has another hypothesis: Northeast Asia needs to have its own model of regime. Also, it assumes that problem awareness and partnership coalition are the most important factors for regime creation. Let me determine it in more detail below.

First, in order to implement more effective and practical management toward DSS problem solving, the idea of rethinking regime is necessary. Also, considering unique characteristics of DSS problem, the constellation of problem awareness (perspectives of problem) among all-involved stakeholders and building of partnership coalition in multilateral level are significant factor of new regime on DSS issue. DSS problem is begun with conflict between two different clashing perspectives – natural phenomenon and human-induced pollution. Differ from other transboundary environmental issues such as acid rain, DSS cannot be solved by PPP (Pollutant Pays Principles). The regime addressing DSS control depends on how to gain the harmony in diverse perspectives among all-involved states. Thus, it assumes that problem awareness and participants' perspective of DSS are one of the key factors for regime formation. Second, it also assumes that new regime will rely more on existence of multilateral partnership based on like-minded group coalition. Through the literature review, it's been found out that there are a number of cooperation networks and discussion channels dealing with DSS issue in current, but most of them are criticized as being still in beginning

stage. In this regard, this research addresses the significance of inter-nongovernmental partnership in transboundary level as well as government-government linkage.

3. Methodology: Interview and Questionnaire

Main methodologies of this research are literature review and questionnaire survey through the interview. The literature approach can help to answer these questions: What is regime? What lead to the regime formation? What kind of role can be expected through the regime creation? Thus, literature study dominates definitions and roles of regime in the environmental field (most prominent: Krasner 1982; E. Hass 1983; P. Hass 1992; Cheon 1995; Young 1999). On the other hand, the research also focuses on the empirical examination of hypothesis. The interview and questionnaire survey is useful not only for understanding current state of DSS countermeasures in Northeast Asia, but also for answering the questions: What is the most desirable and sustainable form of cooperation to deal with DSS problem in Northeast Asia? Which factor can be a driving force toward formation of such cooperation? How successfully current existing initiatives meet the needs of such factor? Through the analysis with these methodologies, it will carry out an answer for main questions: Why Northeast Asia has not been able to create the regime dealing with DSS problem? Is it indispensable to apply traditional regime concept to Northeast Asia? Instead of that, is it necessary to build the new regime model toward problem-solving? Underdal mentioned that analysis should be tested for reliability by interviewing experts (1992). Theory is used as a tool for explanation, and the data from interview are a given fact which reflects the “reality”. Therefore, this research combines both theoretical and empirical approaches to offer a solution in more desirable way.

3.1.Construction of Questionnaire

In this research, questionnaire is constructed to measure the reliability of hypothesis: 1) It would be consensual knowledge which takes priority to encourage the solving of DSS problem.

2) In Northeast Asia, the traditional concept of regime is not indispensable to activate such key factors of shared knowledge and sufficient problem awareness. That is, shift of regime paradigm is necessary to increase the productivity of problem solving. Also, it would be possible to expect the most desirable and sustainable design of new regime, which can be explained by terms of non-regulatory centric and voluntarily participation of multiple stakeholders.

The questionnaire and interview survey will be used as a tool for estimating possibility and indispensability of traditional regime, and the contents of the questionnaire are applied to regime theory which has been discussed in Chapter 2 (Table 6). First, the research seeks what the biggest obstacle in creating DSS regime is and what the most promoting solution is. For those, it explores 1) what kind of and how serious damage has been occurred in different parts of society – sides of economy, ecology, health and transportation of each country, and 2) how well such problem awareness and shared problem understanding among all-involved stakeholders have been promoted. It will look if all stakeholders within one country have sufficient problem awareness and shared understanding on problem. In order to identify the significance of gaining economic interest in problem solving as well as the factor of knowledge, the question asks about 3) relationship between current countermeasure and its impact on society and how deeply DSS involved-actors concern about its own economic interest.

Second, by asking about current process of problem identification and knowledge distributing, the research finds out how well current countermeasures take a role to mitigate the problem. This part analyzes 1) reputation of existing initiatives' activities and 2) current condition of inter-state data-sharing by identifying monitoring and forecasting system of each country. Also, it is applied by 6 roles of effective environmental regime in Young's theory to measure the efficiency of existing countermeasures. Among those 6, the question will cover

mainly 5 roles of them – Utility Modifier, Role definer, Agents of Internal Realignments, Enhancer of cooperation and Bestowers of authority, because this research does not cover the calculation of numerical value made by existing countermeasures to prove whether the role as learning facility meet the needs of cost efficiency or not. However, despite of no analysis about cost-efficiency, Young's theory would still be useful to be applied into DSS case in Northeast Asia. Those key roles are used as criteria to measure whether existing initiatives meet the needs of traditional regime, and prove whether traditional regime do function of problem solving in Northeast Asia. In detail about the questionnaire, question about expected future benefit will provide the answer for the role as utility modifier. It is for analyzing how much perception for common interest has been built among various stakeholders. Second, role as Agents of Internal Realignments can be measured by degree of shared understanding of problem among all involved actors. Without sufficient level of shared perspective and problem understanding, it would be hard to expect for actors to change their behavior and pattern of decision-making toward one collective goal. efficiency of current initiatives and significance of legally-binding system in Northeast Asia. Next, understanding how successfully the roles distributed among a number of initiatives and discussion channels and whether they are duplicated or not will provide the estimation for role as role definers. It also identify whether the role as enhancers of cooperation is established or not. The last role as bestowers of authority will be considered by asking how DSS-involved actors think about legally-binding regulation. Then, it can measure whether traditional regime is meaningful in DSS case or not. Also, in the end, this research expects to bring out the way to overcome current limitation and suggest new concept of regime.

Additionally, questionnaire concerns on perception of each stakeholder about legally-binding and regulatory system, and tries to analyze the significance of traditional regime building in DSS case.

		Korea	Japan	China	Mongolia
Problem Type	Impact				
	View point				
Current Counter-measures	Leader				
	Focal point				
	Existing initiative				
	Inter-linkage				
Future Counter-measures	Leader				
	Approach				
Expected benefit					
Biggest Obstacle					

Table 6. Questionnaire tool

3.2.Interviewee Selection

For considering transboundary issue of DSS problem, it needs to cover all-involved countries – Mongolia, China, Korea and Japan. Since this research focuses on indispensability of traditional government-led regime theory, it also needs to cover diverse stakeholders who are directly and indirectly involved in DSS issue. However, through this methodology, only a

tendency toward regime formation of diverse actors can be observed, because cooperation building in environmental area is influenced not only by ecological recovery but also by a number of external factors such as political, economic, and social elements. However, it's clear that tendency involves a certain degree of speculation (Litta 2012, p. 77).

	Korea	Japan	China	Mongolia
Government officials	MOE, Meteorological administration, Forestry Service			
Business	Private company			
Academia	Government affiliated institution, University (International cooperation division, meteorology or forestry division)			
NGO	International/ Local NGO			
Others		Local government, (Fukuoka), OECC		

Table 7. Affiliation of the expected interviewees

Since in traditional regime theory state government is a core and only possible member who constructs the regime, most of major countermeasures addressing DSS problem mitigation are led by state government. From this reason, interviewee from government side has the biggest size than others. It is Ministry of Environment in each country which has a main leadership to encourage current activity and lead existing discussion channel. Since some part of DSS has been regarded as national phenomenon in term of its meteorological and climate impact, meteorological administration of each country is also selected as a target for the survey. Also, administration of forestry needs to be included because of the relationship between DSS and

desertification, especially in source area of China and Mongolia. From that reason, as Korean interviewee, Ministry of Environment of Korea, Korean meteorological administration and Korean Forestry Service are selected. In case of Japan, department of air and transportation and that of ground environment under Ministry of Environment of Japan, and Japan Meteorological Administration are main targets, but the research also considers two more interviewees, which are Overseas Environmental Cooperation Center (OECC) and Local government of Fukuoka. OECC and Ministry of Environment of Japan have been worked together to prepare the DSS joint meeting, which is affiliated with Tripartite Environment Ministry Meeting among Korea, China and Japan (TEMM), and Fukuoka is one of the regions which have attacked most seriously by DSS problem because of geographical reason. In China, it is Ministry of Environmental Protection (MEP) which is equivalent with ministry of environment in Korea and Japan, and there is MEP-affiliated research institute, called CNEMC (Chinese National Environmental Monitoring Center). In addition, Chinese Meteorological Administration and State Forestry Agency (SFA) which mainly concern desertification issue are also included in the target list of interview. In the end, for Mongolia, it is Ministry of Nature and Environment of Mongolia to be contacted in main. However, because of political dynamics, it was hard to contact with all of these expected interviewees. More detailed explanation about the successfully contacted interviewee will be introduced in next chapter.

Second, most of stakeholders who related with DSS from business and NGO side can be found in Korea and Japan. In order to select the target in business side, the research concentrates on identifying companies who are doing CSR (Corporate Social Responsibility), and there are few companies in the area of air flight, vehicle, and oil business.

At last, interviewees from academia are mainly found out at the government affiliated institution, since most of the major investigations on DSS have been led by government. In addition, the professors in international cooperation department are also included in target of interview, because the issue of regime creation is largely discussed in the field of international studies.

3.3.(Un)expected difficulties

3.3.1. Critics of regime theory

At all events, there are both good and bad sides. A number of the Neorealist criticize that the concept of regime is obfuscating and confusing (Stragne 1993, p. 337). There are large kinds of different definitions of regimes, as has been noted earlier in this research[11]. One model of regime cannot integrated into a larger and consistent theory, thus this criticism is not available to be wiped out in this research. However, the definition of the term that the author chose is determined in the chapter of theoretical assumption. It builds upon the traditional European regime theory, which is national government-led legally-binding instrument, in the first pace, but this research suggests the new-model of regime which can connects well to DSS problematic situation in Northeast Asia.

3.3.2 Inevitability of making generable statements

As typical in many research fields in the social sciences, theories face on the difficulty of generalization. In order to measure the possibility of regime formation, there is a need to establish causal links between observable outcomes and regime. Theories are tested through

[11]Refer to chapter 2(pp. 9-20)

single case of DSS merely in one region of Northeast Asia with insufficient attention to variable definition and case selection (Litta 2012, p. 86). As a result, researchers have not produced generalizable answer as to what types of regime model are more successful than others under specific conditions. In order to mitigate this limitation, the research uses the methodology of interviewee and questionnaire with key stakeholders. Underdal (1992, pp. 236-237) mentioned that analysis involves 'impressionistic judgment' and should be tested by interviewing experts to check whether they share ones' evaluation. Data from interview and questionnaire that are going to be analyzed will be considered in several ways to extract the most appropriate result, and the selection of interviewees was also scrutinized in such as detailed manner, in terms of their representative and connection with problem, that the author will be in position to make some causal claims about the reliability of regime model in Northeast Asia addressing DSS problem mitigation. However, these claims will not be generalized.

3.3.3. Data Sorrows

It's not exaggeration to say that almost every research face on crucial point, which is availability of sufficient and reliable data. Despite of the existence of information resource, a plethora of articles, books about regime and DSS, and well-organized websites, these could only be used as a first encounter to cases, but not as sufficient material to answer my research questions. For example, slow update of website, linguistic limitation among various countries' reports, and nature of technical articles can be considerable. It makes difficult to concentrate on exclusively on regime possibility in the form of problem-solving. In my research, after having analyzed all available materials (both online and offline), I took the opportunity to become an observer in DSS Working group1 of TEMM in this year. Being on site in TEMM had 2 major advantages: 1) I became available to me using a broad band of new secondary resources,

conference papers and real voices of stakeholders. 2) I was able to conduct a certain number of expert interviews with different countries' stakeholders. These were intended to fill the data gap that still existed and, also to gather opinions and estimates about possibility of regime formation questions from different perspectives. However, during the interview process, some problems occurred; 1) During the interviews, I realized that the interviewed person is not knowledgeable enough, in case that the question is not related with interview's own major. 2) Some of interviewees are not willing to answer in a meaningful way with certain reason, such as political dynamics. The mentioned problems did not occurred in many cases. In most cases, interviewees granted me as much time as possible and where also available via telephone, and e-mail based contact.

3.3.4. Debated Measurement Parameters

Here, one conflictual question left: can one expect that once actors' have agreed to regime model and the opinion about regime possibility for a common problem, the very regime will be suitable and sufficiently effective? In usual, it is easier to say that regime is created and work effective if the environmental problem is solved. Under non-regime circumstance, however, it is hard to say that my expectation is available in every case. However, from social science perspective, it is much more interesting to analyze the change of actors' behaviors and regime formation process, that is, development of mechanism of cooperation. Thus, this research will measure the reliability of hypothesis about regime possibility by looking how the involved parties react in real as well as by considering theoretical approach. Also, if there were no serious reaction, will and efforts to solve problem under existing regime model, the default option would have been the no-regime and necessity of new model instead of traditional regime model.

However, when using exclusively qualitative methods, there are “inherent problems of generalizability” due to the small number of cases (Mitchell 2002, p. 59). According to Litta (2012, p. 75), most of research efforts that try to cover various cases in qualitative research are still constrained by the absence of real comparison. It brings the problem of generalizations of the result that doesn’t guarantee the internal validity, while quantitative methods have also been criticized for gaining too little knowledge and detail about specific features, in reality.

4. Result

4.1.Result from Questionnaire and Interview survey

These questionnaire and interview surveys have attempted to sketch out distinctive characteristics of DSS problem in Northeast Asia. It identified 7 distinctive features in the regime formation process, and can be categorized largely in 5 groups. The first is gap of perspectives viewing the problem among stakeholders in both intra and interstate levels, and the second shows lack of concern in common interest by DSS-involved states. Third is about lower concentration on economic factor, and larger interest in factor regarding shared knowledge and problem awareness. That is, there is no apparent and less direct causal connection between DSS problem solving and national development. Fourth feature describes low awareness and expectation of other initiatives, and it explains low efficiency of current countermeasures toward regime building in both national and multilateral perspectives. At last, fifth, DSS-involved states tend to reluctant to regulatory regime building and expects increasing role of non-state actors as a core member of regime construction.

4.1.1. Interviewee

Before entering into the main analysis of the survey, I shall briefly address the interviewees who responded to this survey. Interviewee selection considers the representativeness and relationship with DSS problem. There are four categories of interviewees to choose from; political side, business side, academic side and side of non-state actors, such as Non-Governmental Organization (NGO) or Non-Profit Organization (NPO). The interviewee also covers the all problem-related countries within Northeast Asia, which are China, Mongolia,

Republic of Korea, and Japan. However, because of political dynamics, it was hard to contact with all of expected interviewees, which are explained in last chapter.[12]

Country	Korea, Japan, China, Mongolia		
Sector	Government	Korea	ME(KMA), KFS (UNCCD/Climate)
		Japan	MOE (Department of Air & Transportation/ Ground Environment), OECC, Local government (Fukuoka)
		China	MEP (SEPA- CNEMC)
		Mongolia	MNE
	Business	Korea	Korean Air, Hanhwa
		Japan	JAL(OISCA)
	Academia (Researcher)	Korea	International Cooperation/ Forestry/Meteorology
		Japan	Forestry and Agriculture/ Meteorology
		China	CRAES (Forestry and ecology)
		Mongolia	Meteorology and Hydrology(National University of Mongolia)
	NGO	Korea	Future Forest
		Japan	OISCA
		China	Alxa Society Entrepreneur & Ecology Association (OISCA), Kubuqi Earth Eco-Village

Table 8. Interviewees who I contacted for my research.

4.1.2. Result 1: Lack of problem awareness and shared perspective

The first is the gap of perspectives viewing the problem among stakeholders in both intra and interstate levels. Answers for 4 questions which are regarded with 1) damage level on four different fields, including economy, transportation, ecological condition and nation's health, with 2) viewpoint on DSS problem of each state, with 3) progress in problem-solving activity process and with 4) expected figure of future leader explain this result. First question aims to explain

[12] Refer to Chapter 3 (pp. 21-27)

how weakly the problem understandings are shared in Northeast Asia rather than knowing how serious damage are made by DSS and in which field does problem occurs. This can be presented with country-to-country based analysis first, and then comparison among all-involved countries' results. In addition to the first one, second question also provides the result about how differently involved-actors see and understand the problem, and the third finding can reach at the same result by taking into account the historical process of problem-solving activity and interest of each state. At last, unlike the first two questions which are concerned with what has been done, question in third asks about expectation for future leader, that is, key actor to the solution of the problem, and estimates level of agreement on future solution.

4.1.2.1. Lack of shared problem understanding

First, about DSS impact on Korea, Korean tends to take care of impact on human health the most, but the answers are based on basic knowledge and experience of interviewees' their own, which means absence of scientific evidence. Over the half of interviewees answered that they cannot sure about the impact for every question. In addition, 37.5 % interviewees said that DSS makes a serious impact on domestic economy, while similar percentage of answers are about weak impact. Thus, it is highly probable that there is lack of common awareness about DSS impact in Korea and the understanding of the problem is scientifically unsupported.

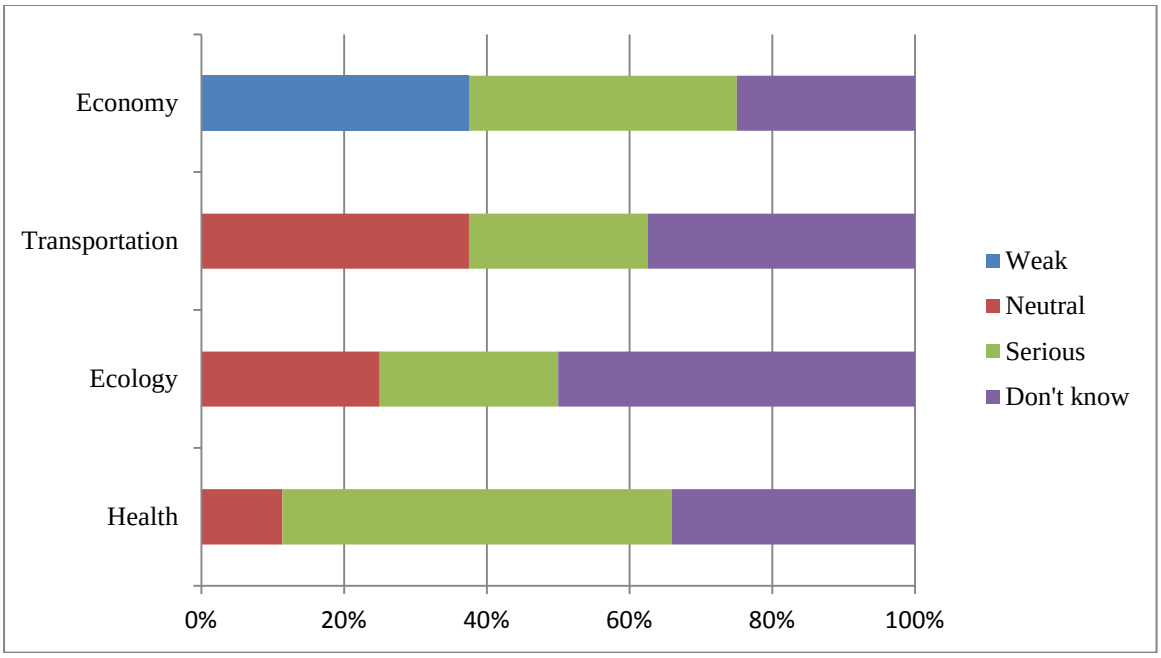

Figure 3. Awareness of DSS impact on Korea

Second, according to Japan, there is a gap in answers between Tokyo and Fukuoka. While interviewees from Fukuoka shows interest in damage on health and traffic condition, interviewees from Tokyo answered mainly don't know or replied based on guess. In this sense, it is understandable to say that common awareness about DSS problem in Japan isn't clear partly because of lack of scientific investigation, and partly because of distance from the source area,[13] and it shows the limited level of awareness sharing in Japan.

[13] It is based on the assumption that the nearer the source area, the stronger the DSS damage.

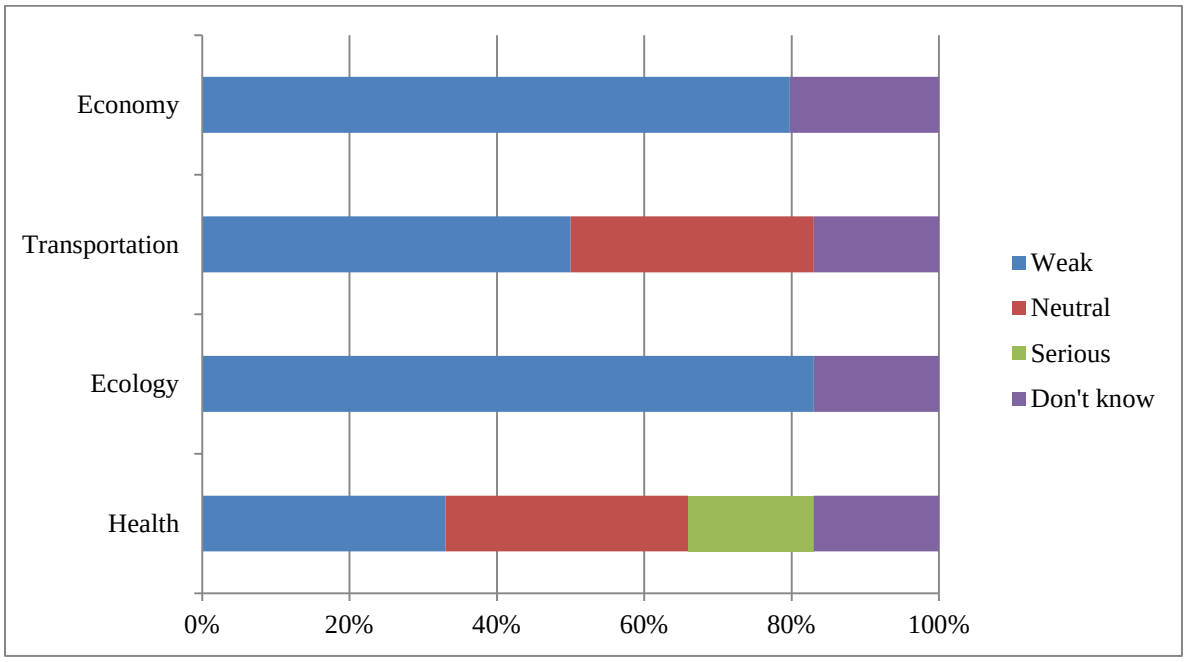

Figure 4. Awareness of DSS impact on Japan

Third, Chinese interviewees aware damages on different parts in nearly equal level, and degree of those impacts on health, economic, transportation, and ecological sides are relatively high, compared to Korea and Japan. However, the degree of awareness is different from region to region, that is, between Western part and Eastern part (Beijing) of China. Interviewee from local NGO in West China, which is closed to DSS sources, considers DSS as limited problem within western part of China, while interviewee from East China points out the increasing frequency and intensity of DSS in Beijing.

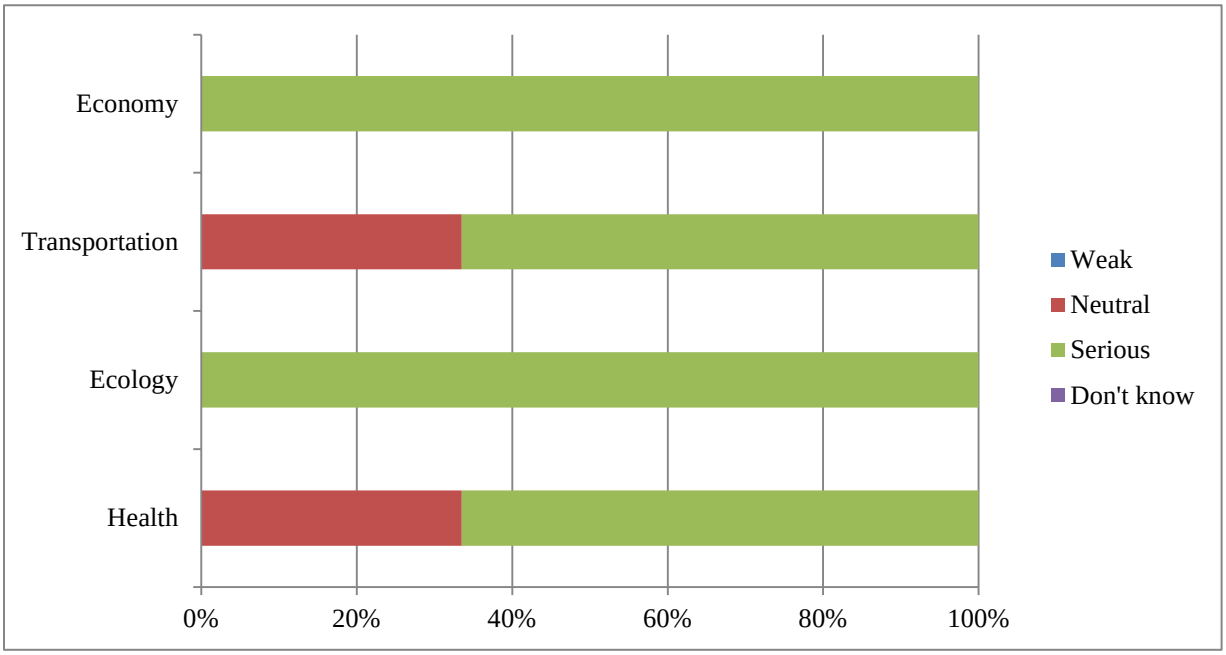

Figure 5. Awareness of DSS impact on China

Fourth, Mongolia, the source of DSS, answers that DSS makes ‘very serious’ impact on all four different fields including economy, traffic and ecological condition and health. However, according to interviewee, it is hard to distinguish damages by DSS from those by other air pollutants, because of lack of scientific technology and also because of too much often DSS occurrence.

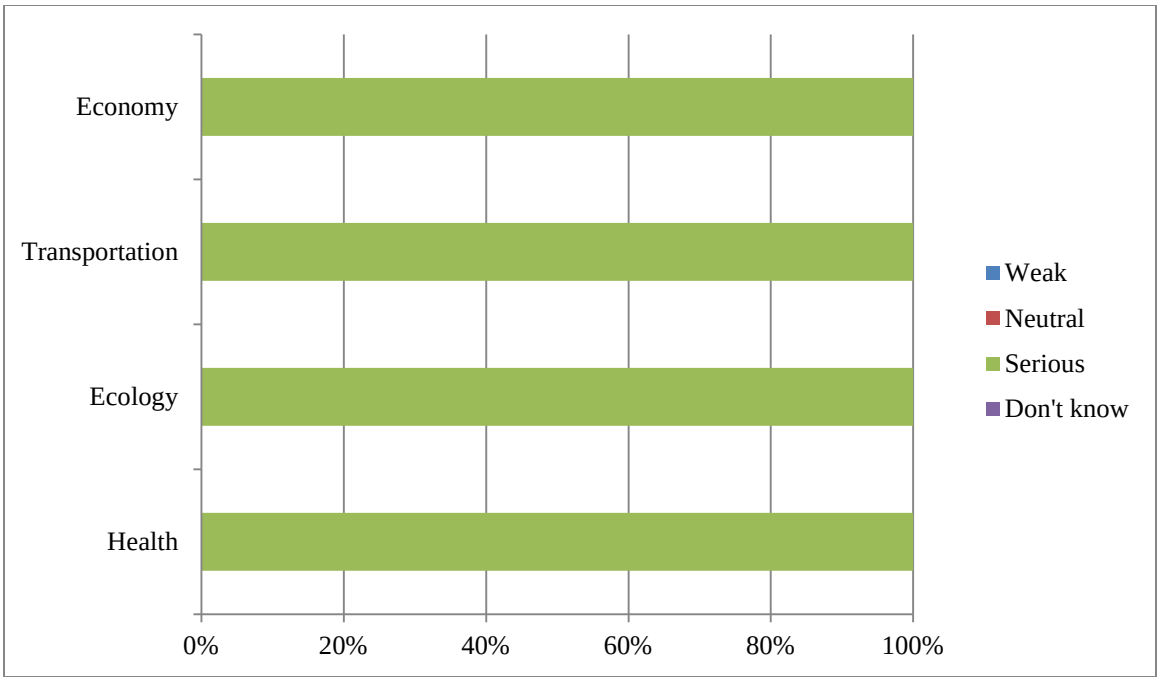

Figure 6. Awareness of DSS impact on Mongolia

Proceedings from what has been said above, it should be concluded that there is no scientific understanding about DSS problem even at domestic level. Therefore, it would be hard to expect for having similar level of problem awareness among diverse stakeholders. Most of Korean and Japanese interviewees answered on the basis of their own knowledge or guess, and interviewees from Japan and China tend to answer differently depending on distance from the problem source. In the end, these provide the result of disagreed understanding in the level of intra-state as well as interstate level.

In addition, the degree of shared understanding is also explained by understanding which point of view does each actor see the problem. For the question do you think DSS is natural phenomenon or human-induced environmental problem, answers differ from actor to actor and it

makes no consensus in both domestic level and level of inter-state. First, in case of Korea, the answers were different depending on the field of interviewee. Interviewees who are working in meteorological or forestry-climate (which is related with UNFCCC) side answered DSS is closed to human-induced pollution rather than natural phenomenon. It identifies that Korea considers DSS as air pollution, and focuses on investigation on chemical particles within wind as well as DSS's occurrence and transport mechanism. On the other hand, interviewees who are working mainly for reforestation activity (from Korean Forestry Service (KFS) and NGO) tend to deal with DSS as a natural phenomenon rather than human-induced pollution. Thus, there is no common perspective of DSS in domestic level of Korea. It is similar with answers from Japanese interviewees showing distinction between actors in forestry sector and in meteorological (climate) sector. While actors who are in case of the latter mentioned that DSS is human-induced problem, Forestry-related actors tend to look at DSS as a natural phenomenon. Also, even China presents different viewpoints from region to region in country level. Interviewee in Northwestern China, which is one of the source areas of DSS, considers it as unavoidable natural phenomenon rather than environmental problem occurred by anthropogenic factors. On the other hand, such anthropogenic factors are more deeply discussed in South-east China, such as Beijing. Fourth, in Mongolia, DSS is recognized as natural phenomenon, and interviewee stated that most of public tends not to expect that DSS can be addressed.

Thus, the conclusion provided above can be briefly stated that there is no shared and scientifically-proved understanding about how much and what kind of damages have been made by DSS in both intra- and inter-state level. Also, it would not be exaggeration to say that each stakeholder considers the problem in different ways.

4.1.2.2.Gap of Progress in activity process

Compared to problem source areas China and Mongolia, implementation of problem mitigation activities in Korea and Japan are proceeding slowly. Despite of concerns of each country on reforestation, the process still remains in beginning stage. According to the interviewee from Korean Forestry Service (KFS), most of reforestation activities has been operated as bilateral level instead of multilateral level and done as short-term project.

First in Korea, most of reforestation activities have been led by KFS, which is affiliated in Ministry of Agriculture and Forestry in Korea. In Korea, pre-investigation to find out appropriate plant species for target area and budget securing have been done in main.[14] Unlike Korea, administration of Forestry of Japan is not concerned on DSS problem. Instead, academia has joined into bilateral reforestation projects and Joint research on DSS especially via the TEMM. The interviewees responded that China is a key country to encourage the substantive problem-solving. According to them, China is in the position of source of the problem, but has capability to lead the problem-solving with rapid economic development, and even China shows cooperative attitude toward joint investigation in recent. Despite of the Chinese positive behavior, one of the main reasons for low progress on problem mitigation is that there is no consensus on target area for reforestation project. For instance, it is Loess plateau which China nominates as one of the main sources of DSS, but DSS occurred at this area has a low influence to Korea and Japan, less than 10%. Thus, without considering cost-efficiency, it'd be hard to develop further support and progress on reforestation project from Korea and Japan.

[14] While Korea has been focused on forestry recovery in China, it tends to be changed to Mongolia because of the economic growth of China.

As problem-source countries, concerns of China and Mongolia on problem mitigation are higher than the rest. Since DSS problem is directly connected with the livelihood issue of local people, national projects and studies to prevent soil and restore the forest have been appeared from 1970s which is earlier than beginning of multilateral initiatives in 1993. In China, most of national projects of DSS and desertification prevention and control have been operated by State Forestry Administration, collaborating with local government and NGOs. According to interviewees from government and NGO of China, one of the most widely known projects is Three-North Shelterbelt Project. Since 1978, it's started under the aim to establish large-scale forestry protecting system in seriously eroded and DSS-occurred area of Three-Norths. In addition, there are other projects focusing on water and ecological issues as well as soil erosion – such as The Natural Forest Protection Project (2000-2010) and the project of Conversion from Cropland to Forest and Grassland (PCCFC, 1999-2010). According to the local NGO who is engaged into Three-North Shelterbelt Project, such kind of large-scaled project can even raise the public awareness. Not only in China, but a number of examples of policy of Mongolian governments such as The Mongolian Action Program for the 21st century, Forest National Program also shows their concern in high level. In an international level, Mongolia became a member country of UNCCD and established the National Action Plan to explore the reason of desertification and find out the substantive solution for reforestation.

However, these national projects are implemented not only to ecological restoration, but more for solving employment problems and strengthening domestic economy. That is, it'd be hard to sure that government interest in DSS-mitigation is sustainable. Also, Mongolian interviewee mentioned that the process of reforestation activities depends on how much technological and financial support from out of the country can be received – mainly from Korea

or Japan. Thus, since government tends to take priority on development of domestic economy and there is no concrete financial resource, it'd be hard to sure about sustainability of problem-mitigation activities.

4.1.2.3. Different idea about future leader

The answers for the question as to who will do a major role of encouraging regional cooperation also arrive at the result: Each stakeholder anticipates different kinds of political leader and it's able to establish that there is a gap of perspective viewing DSS problem among all-involved states.

In Korea, the answers are divided into two, responses from state and from non-state actor. Response from state government side is that leadership of national government is the most probable. On the other hand, from the interview with NGO, the expected leader is not a one certain state, but collaborative community covering multi-stakeholders is stated as the one who should take a leadership to solve such transboundary problem. However, the issue which country should take the biggest responsibility as a leader is a wedge issue even for interviewees from state government side. Interviewee from meteorology and climate-relevant department answers that leadership should be taken by China, while interviewee from forestry department mentioned Korea is the one who will do a role of environmental leader in Northeast Asia.

Second, Japanese answers for the question are agreed into one answer, national government throughout the country. Only responds from academia of forestry side nominated the name of certain country, which is China, as the country should lead the regional cooperation.

Third, China and Mongolia response similarly each other but differ from others. Though the answers for the questions are limited to the responses from NGOs of each country, their expected figures of future leader are the one and same, international organization. Both

anticipated that international organization will do role as a mediator between state and non-state actors, and financial supporter.

From these evidences, it seems reasonable to conclude that disagreement on future leader is related with the fact that each actor gets a different point of view on problem. For example, taking into account that Korean forestry side considers DSS as natural phenomenon and Korea as a probable leader, and Japanese forestry side considers DSS as human-induced problem and China as the one who should encourage problem-solving, it can be concluded that: 1) From Korean perspective, it is financial and technological capacity that is the most significant concern to solve DSS, such an unavoidable natural disaster. 2) From Japanese perspective, it is the problem source (which is mainly China) who can and should make the biggest contribution to problem-solving, by changing their behavior and limiting its human-induced pollutants. Therefore, it's possible to draw the conclusion that there is no consensus among stakeholders about what kind of leader can be expected and should be encouraged for the problem mitigation in the case of DSS.

4.1.3. Result 2: Lack of concern in common interest

Result 3: Concentration more on knowledge and awareness factor than economic factor

One of the findings from this survey offers that DSS problem and the concerns of national development are less direct. In general, it is linkage between environment and economic development which makes most transboundary environmental problems face difficulties to be solved by controlling each country's behavior and distributing interest to all equitably, and the interest is considered as one of the significant key factors for regime creation in that sense. In contrast, the fact that there is no serious harmful effect on national development caused by DSS problem-solving can demonstrate that the factor of interest is not a key word to create DSS

regime. For the questions how important the economic development in your country is, every interviewee answers ‘very important’, while it’s identified that the efforts toward DSS mitigation do not provide significant and negative impact on national development from the interview and questionnaire. From this evidence, one result can be drawn about the dispensability of applying traditional regime concept to Northeast Asia.

4.1.3.1.Expected benefit through the DSS problem-solving

First, the responses from Korea are different depending on the field in which the interviewee is included. First, the interviewee from meteorological and climate relevant department show the interests in health benefit. On the other hand, it is political benefit by being an environmental leader that researchers and NGO actors who are working for reforestation expect.

Next, in Japan, most of respondents answered that they expect the political benefit through participation into the regional cooperation, but politician from Fukuoka side mentioned that improvement of public health is the most significant and reasonable benefit.

Third, Chinese respondents from government expected that the cooperative activity addressing DSS and desertification problem can solve the domestic problem of economic aspect, such as employment problem. On the other hand, for NGO side, it’s more significant to have interest in health and ecological sides, with the improvement of livelihood condition of public.

In the end, similar with China, Mongolian interviewee from governmental side mentioned economic benefit the first, but it is more concentrated on technological support from out of their country, and health issue is followed in second. On the other hand, NGO interviewee responded improvement of livelihood condition of nations with improvement of public health and ecological condition.

4.1.3.2. Biggest obstacles to establish DSS regime

Korea and Japan: Both countries' answers are similar, but there are gaps between state and non-state actors. Here, state actor includes one from government and ministry-affiliated researchers, and non-state actor means actor form NGO mainly. First, government and government associated research institutions concern about the low willingness of problem-solving in governmental level. Also, they face on difficulty of limited data-sharing, which is mainly based on political dynamics. Different political system of each country makes it difficult to access and utilize the necessary data for problem-solving, and then it brings to low understanding level of problem seriousness as well as low cost-effectiveness of countermeasures. In the end, it can aggravate the low participation of countries. Second, from the NGO's point of view, low level of public awareness is urgent obstacle. The problem of lack of financial resources makes it hard to arrange the education or training system for public.

China and Mongolia: Lack of public awareness is responded as the biggest obstacles in China and Mongolia. According to the interviewee, the situation is more serious in local area, especially in the young generation, because of insufficient education chance and poor experience in green forest.

4.1.4. Result 4: Low efficiency of current countermeasures

One of the findings from the survey is that current countermeasures do not receive the positive evaluation. As a mean for creating data sharing system in regional level and for operating practical problem-solving activities, the efforts have been estimated negatively, though a number of bilateral and multilateral cooperative works and discussion channels have blossomed. In order to measure the level of the efficiency, the survey identifies 1) current

political system dealing with DSS in each country 2) existing monitoring and forecasting systems, and progress in pre-investigation process for reforestation activity which are currently in use in each country, and verifies the degree of communization of those systems which are necessary to make data-sharing available. Also, by considering whether currently existing initiatives are recognized and how successful these have worked, it would be possible to understand the level of efficiency.

4.1.4.1. Different political system

The current state of political system is different from country to country. In Korea and Japan, inter-ministerial linkage could be found, but, on the contrary, the situations in China and Mongolia are sharply different. Chinese political system is rather sub-ordinate, and it was understandable that there is relatively serious wall between state and non-state actor.

Korea: It is Ministry of Environment (ME) that has operated most of key countermeasures dealing with DSS in Korea. Korean Meteorological administration (KMA) has worked in this field as a bureau within ME, and Korea Forestry Service (KFS/ Korean Forestry Administration) which is Ministry of Agriculture and Forestry – affiliated is also concerned in DSS (e.g.,Figure 7.). In 2007, Korean government decided to establish the DSS countermeasure committee which is composed of 16 related ministries and specialists in meteorology, air environment, and preventive medicine, and it expects to widen the scope of activity via the connection with non-state actors, such as NGO (e.g., Figure 8.).

Figure 7. Korean Governmental System

(Source: Website of Blue house (Chungwadae), www.president.go.kr/che)

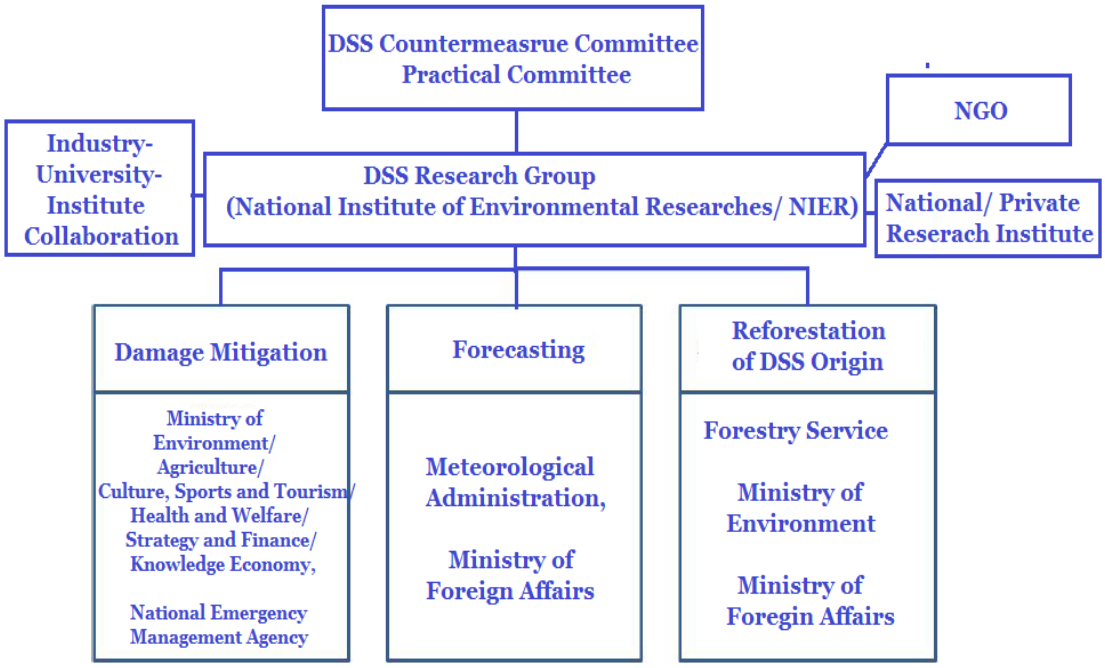

Figure 8. Korea DSS Countermeasure Committee's Structure

Source: Korean Ministry of Environment (2011 p.38)

Japan: Japanese governmental system is different from Korea, but it can be found that various ministries are connected to deal with environmental issues. In the case of Japan, Ministry of Environment (MOE) and Japanese Meteorological Administration are separated, but both are working together to tackle DSS problem. On the other hand, the forestry administration in Japanese government is not concerned in this trans-boundary issue, though it's connected with anti-desertification project. Even at TEMM meeting, one of the most representative initiatives regarding DSS countermeasures in multilateral level, merely scholars and researchers from certain universities joined as participant of forestry side.

China: It is Ministry of Environmental Protection (MEP) which is concerned in DSS countermeasures mainly in government of China, and MEP-affiliated scientific institutes, called CNEMC (Chinese National Environmental Monitoring Center) and CRAES (Chinese Research Academy of Environmental Sciences) do a research about DSS and join TEMM. In addition, there are three more institutions at the central governmental or institutional level which are directly and indirectly responsible for the prevention and control of DSS, especially for the monitoring, forecasting and early warning – such as The Central Meteorological Agency (CMA), The State Forestry Agency (SFA), and The Chinese Academy of Sciences (CAS) (e.g.,Figure 9.). However, the situation in China is complicated as such a number of different agencies and institutions maintain monitoring networks within the nation by using its own network, and it's not always possible to access to the data of each other.

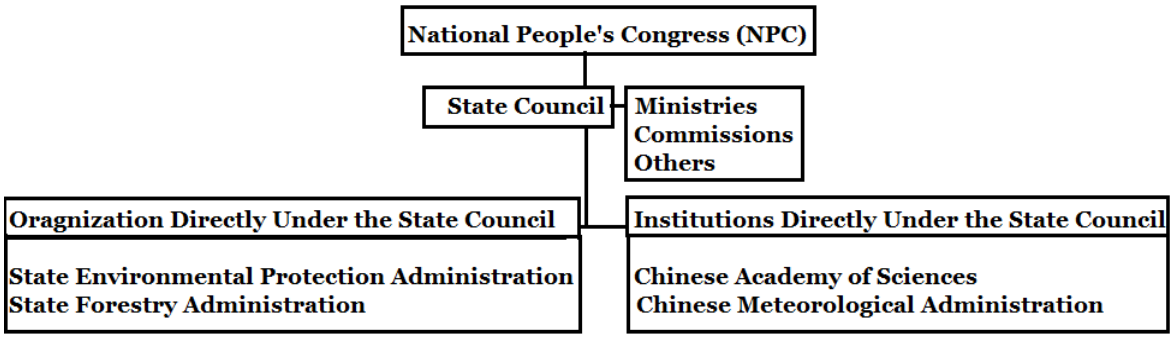

Figure 9. Chinese DSS-involved governmental system

Source: Own compilation from interview and documents of CRDS (2010, p.35)

Mongolia: It is Ministry of Nature and Environment of Mongolia, which is concerned with DSS problem in Mongolia. The data gathered from government-operated weather and monitoring systems within county is delivered to institute of hydrometeorology and provincial meteorological center, though it's merely few number of stations which is working because of the lack of financial capacity. On the other hand, it was possible to find out the transnational inter-governmental linkage from the meteorological side of Mongolian government (e.g., Figure 10.). The monitoring and forecasting data has been shared with WMO (World Meteorological Organization) and member countries of DSS joint research committee – Korea, Japan and China.

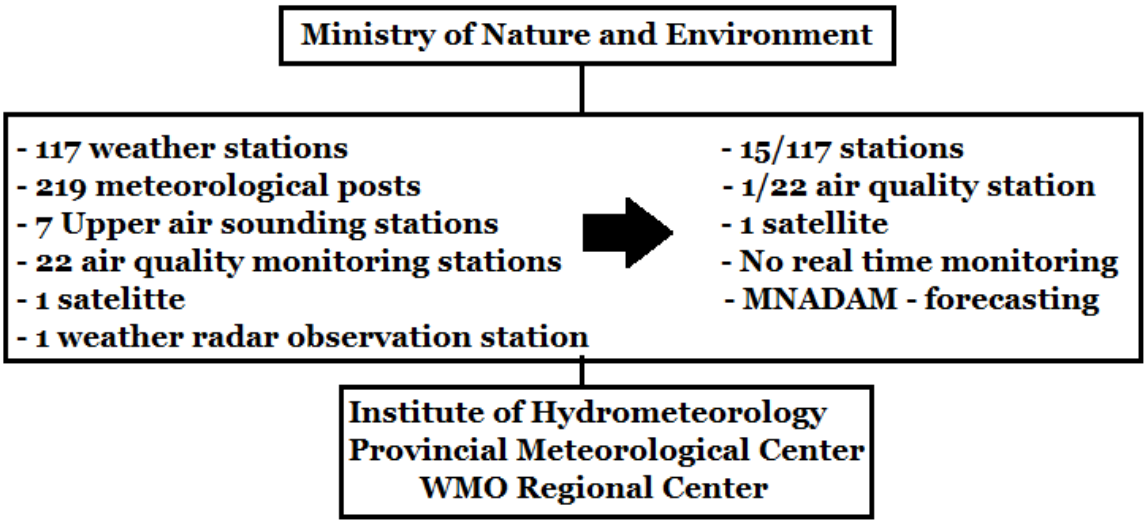

Figure 10. Mongolian DSS-related governmental system

Source: materials from UNEP document (2004, p.8.)

4.1.4.2. Lack of common monitoring and forecasting system

There is difference in monitoring and forecasting standard depending oncountry. Japan is the only country which measures concentration of fine particulate matter PM2.5, in contrast to other countries concerning mainly on PM10. Also, there is no common DSS forecasting and transportation model, though Mongolian model is imported from Korean. On the other hand, in problem mitigation efforts, China and Mongolia tends to take better initiative on reforestation activity, rather than the rest. Let me explain each country's monitoring system in detail.

Korea:

1) DSS observation system: Korean Meteorological Administration (KMA) conduct automatic measurement of concentration of PM10 at 28 weather stations and these data are served as

one hour averaged value in real time on the website. In addition, visual observation of DSS is also conducted based on the color of sky, and observation record including the time when DSS is confirmed to start and end, and the range of visibility are published on the website of KMA[15] in real time. LIDAR (Light Detection And Ranging observation system) data is also recorded, but it's not published on the website.

2) DSS transportation model, ADAM-SDS: The four-season Asian Dust Aerosol Model (ADAM) was developed by Korea, and it's mainly done by using surface PM10 concentration cross the country.

Japan:

1) DSS observation system: In Japan, visual observation of DSS is conducted at 61 stations across Japan, and observation data includes the time duration from state to end of observation, and range of visibility. In addition to that, measurement of concentration of suspended particulate matters (PM10, PM2.5) is also conducted mainly by local governments. One of the most significant observation systems in Japan is LIDAR. It sets at 5 stations by Ministry of Environment and 7 stations by NIES (National Institute of Environmental Science) and/or universities/ research institutions as of March 2012. All observed result are published on the website, but the first one (visibility data) is on the web site of JMA[16] (Japanese Meteorological Administration), second one about PM10 and PM2.5 is on the web site of

[15] http://www.kma.go.kr/weather/observation/currentweather.jsp

[16] www.jma.go.jp/kosa

MOE (Ministry of Environment[17]), and the data of LIDAR can be found on the web site of NIES in real time[18].

2) DSS transportation model: In order to identify the mechanism of DSS transportation, there are two different types of representative models, which are called as MASINGAR and CFORS of each. First, MASINGAR (Model of Aerosol Species IN the Global AtmospheRe) is global aerosol transport model, which is combined by AGCM (Atmospheric General Circulation Model), CTM (Chemistry Transport Model). The other one, CFORS (Chemical weather FORcast System), is a regional model which calculates transportation of anthropogenic and natural substances.

China:

1) There are two monitoring network that can be utilized as DSS monitoring system, one is the state ambient air quality monitoring network and the other one is DSS monitoring network. First, the state ambient air quality monitoring network is composed of 661 stations in 113 major cities, and each of them is operated by local monitoring centers. These local centers conduct daily averaged concentration of PM10, air flow check and correction, station environmental control and so on, and the result is published on the website of CNEMC[19] (Chinese National Environmental Monitoring Center). On the other hand, DSS monitoring network was established specially for identifying DSS impact on ambient air quality. It is

[17] http://soramame.taiki.go.jp

[18] http://www-lidar.nies.go.jp

[19] www.cnemc.cn

consist of 82 monitoring stations with continuous observation for TSP (Total Suspended Particulate) and PM10.

Mongolia:

1) DSS observation system: Within Mongolia, visual observation of DSS is operated at 130 meteorological stations and 199 posts. The recorded data from this observation system are same with Korea and Japan, which are the time when DSS is confirmed to start and end, and the range of visibility, and it is published on the website of Institute of Meteorology and Hydrology[20] in near real time, because automatic measurement devices for exact real time publishing are not existed. For observing the concentration of particulate matter, PM10, 10 dust monitoring sites are collecting aerosols, and collaborative institutes are implementing the data analysis and evaluation.
2) DSS forecasting/transportation model, MGLADAM: The dust forecasting/ transportation model, MGLADAM (Mongolian ADAM), was developed by Korea Meteorological Administration (KMA) in 2002, and its operation started in August 2010. Since late 2010, it has been managed and conducted by NAMEC (National Agency of Meteorology and Environmental Monitoring).

4.1.4.3. Low awareness and expectation about the role of currently existing initiatives

Although a number of multilateral initiatives concerning DSS problem have been established within Northeast Asia, it is merely TEMM that all countries recognize in common. In Korea, most interviewees without researcher in meteorological side aware that NEASPEC is also concerned with DSS, and NEAFN's activity is known by an actor in forestry area. On the other

[20] http://tsag-agaar.mn/

hands, in the other countries, TEMM is the only initiative which is known to DSS-related stakeholders without interviewees in political area.

			TEMM	NEASPEC	NEAC	ECOASIA
Korea	Government		√	√	√	√
	NGO		√			
	Researcher	Meteorology	√			
		Forestry	√	√		
	Business		√			
Japan	Government		√	√		
	NGO					
	Researcher	Meteorology	√	√	√	
		Forestry	√			
	Business					
China	Government		√			
	NGO					
	Researcher	Meteorology				
		Forestry				
	Business					
Mongolia	Government		√			
	NGO					
	Researcher	Meteorology	√			
		Forestry				
	Business					

Table 9. Recognition of currently existing initiatives

			No	A little	Neutral	Good	Very Well
Korea	Government					√	
	NGO			√			
	Researcher	Meteorology			√		
		Forestry		√			
	Business			√			
Japan	Government			√			
	NGO						
	Researcher	Meteorology			√		
		Forestry		√			
	Business						
China	Government				√		
	NGO						
	Researcher	Meteorology					
		Forestry					
	Business						
Mongolia	Government				√		
	NGO						
	Researcher	Meteorology			√		
		Forestry					
	Business						

Table 10. Estimation about Effectiveness of TEMM

The findings from the research on current countermeasures provide that: 1) Political dynamics and different levels of inter-ministerial linkage of each country makes a disturbance to supply the necessary data in both domestic and regional level. 2) Inequality in monitoring system and standard for data-analysis leads to difficulty centralizing the data from diverse problem-sources and constructing concrete data-sharing system over the region. 3) Lack of identification of existing state-led initiatives and low evaluation of them can be an evidence to substantiate limitation of current state government-centric regime.

4.1.5. Result 5: Reluctance to promote regulatory regime

4.1.5.1. Tendency to reluctant to legally-binding system

Following that the finding about less direct relationship between economic development and DSS problem-solving, there is another evidence to substantiate low significance of traditional regime concept on Northeast Asia: Finding of reluctant tendency to institutionalized regime for DSS mitigation. As a respond to challenges from globalization, the number of states have chosen to have linked relationship with neighboring countries and pursued the formation of coordinated systems for creating synergetic effects even in the environmental field as well as market for other goods or services. Under this orientation, Northeast Asia has also made an effort to create concrete regulatory regime in order to control each domestic policy with international norms, and TEMM can be an example which is raised by environmental agencies of each state government to seek for making regulatory framework. However, in spite of a number of efforts to achieve the objective of DSS problem mitigation by forming concrete and regulatory system, the idea of such legally-binding regulatory system tends to be failed in this field. Progress on existing initiatives stop in the beginning level and theirs operational efficiency to implement practical activity is far off. According to Table 11, most of responses are concentrated in an

answer ‘little’.[21] Since the Northeast Asian states does not adhere to the regulatory system and do not expect to put on restraints on states’ participations, they held no intention of forming formal regime with power of sovereign state.

[21] Table 11 refers that encouraging legally-binding system is not feasible in case of DSS, but there are three exceptions, which are from academia on forestry side in Japan and government and academia on meteorological side in Mongolia. These three interviewees put the comment that voluntary cooperation is still hard to expect in Northeast Asia.

			Not at all	Little	Neutral	Important	Very important
Korea	Government			√			
	NGO			√			
	Researcher	Meteorology			√		
		Forestry		√	√		
	Business			√			
Japan	Government			√			
	NGO			√			
	Researcher	Meteorology		√			
		Forestry				√	
	Business			√			
China	Government						
	NGO			√	√		
	Researcher	Meteorology					
		Forestry					
	Business						
Mongolia	Government						√
	NGO						
	Researcher	Meteorology					√
		Forestry					
	Business						

Table11. Importance evaluation of legally-binding regulation in case of DSS

On the other hand, three countries Korea, Japan, and China agreed that voluntary-based cooperation building is suitable for Northeast Asia, rather than politically pressured approach with legally – binding instrument. Only forestry side interviewees in Japan disagreed and mentioned that it's hard to expect voluntary cooperation of source countries. Same with the forestry side interviewees in Japan, Mongolia also shows the negative attitude for voluntary-based approach, and more positive on legally-binding approach for cooperation building.

			Not at all	Little	Neutral	Important	Very important
Korea	Government					√	
	NGO						√
	Researcher	Meteorology				√	
		Forestry					√
	Business					√	
Japan	Government					√	
	NGO					√	
	Researcher	Meteorology					
		Forestry		√			
	Business					√	
China	Government						
	NGO					√	√
	Researcher	Meteorology					
		Forestry					
	Business						
Mongolia	Government						√
	NGO			√			
	Researcher	Meteorology		√			
		Forestry					
	Business						

Table 12. Importance evaluation of voluntarily participated cooperation in case of DSS

4.1.5.2. Growing influence of non-state actors

This interview and questionnaire survey includes diverse kinds of targets who are concerned with DSS problem, from state to non-state actors. As a result of such multi-dimensional approach, there is a finding of increasing role of transboundary networks among non-state actors in problem-solving and political decision-making process. In the field of DSS protection, transboundary NGO networks emerged. Although the influence of NGO networks on policy making process is still limited and most of current political decision is made by political affairs in state level, Korea, Japan, China and Mongolia have recognized the need to foster more harmonious and transparent community by using bottom-up approach for solving DSS problem in practical way. According to the interviews with non-state actors including environmental NGOs and business actors of each country, they've made a number of linkages over their territories. Also, the movement has been found out even in another area, business as an instance, and it can be recognized more clearly from the sentence below;

> At the sixth trilateral summit in 2004, leaders form three countries in Northeast Asia, China, Japan and Korea, made an agreement to 'establish a mechanism among the governments of three countries…with input from the business sector.'[22]

4.1.5.3. Transboundary inter-linkage among non-state actors

Although the linkage between state and non-state actors are still weak, there are several types of coordinated activities within grass-root level. For example, one Korean NGO called Future Forest has made connections with private company and International organization, such

[22] http://www.mfa.gov.cn/eng/wjb/zzjg/yzs/dqzzywt/tl75827.htm.

as UNCCD and UNFCCC. In addition, it works with other NGOs which are organized both inside and outside of Korean territory.

In terms of activities led by Japanese non-state stakeholders, relatively high level of coordination can also be found, especially in two cases. One of them is city-level DSS committee, encouraged by Fukuoka local government in 2002. This is the first city initiated DSS forecast reporting system, collaborated with university, hospital, elementary school, local meteorological center and media. The other one is cooperation between NGO and private company. In Japan, there are several enterprises that have or had worked for prevention and control of DSS as a CSR activity, such as Japan Airline and Toyota. These support the activities of trans-national NGO of Japan which is connected with local NGO in source countries, such as China and Mongolia. The transnational inter-nongovernmental cooperation tends to be grown over the border.

About Chinese case, though the power of civil-society in China is not weaker than other countries, an increasing number of voices from NGO to solve environmental problem can be recognized through the interview. Interviewee from NGO side responded that Chinese government tends to consider its domestic NGOs as a supporting actor for governmental policy, but it's clear that grass-root level of movement in China has been grown up even in slow speed. NGO in China can be classified into two groups in large, one of them is governmental organized NGOs and the other one is independent NGOs. In case of government-related NGO, it influences national politics and shows the linkage between state and non-state actors, despite of insufficient support from government side. Part of them is connected with international NGOs and international organization even indirectly.

At last, Mongolia has low level of public awareness basically. Since a large number of nations still lead their traditional nomadic life, interviewee responded that it's hard to educate

and deliver them the knowledge about how to deal with DSS as well as how much serious problem can be occurred from their overgrazing lifestyle, which is one of the most serious reasons of DSS and desertification. According to the interviewee from Mongolia, however, it was recognized that there are a number of non-state communities dealing with environmental problem, such as DSS, though it was difficult to have an answer from them directly. Most of them are linked with international NGO or governments of Korea or Japan.

4.1.5.4. NGO and Business

As it's mentioned above, not only actors from NGOs, but the business actors have also formed linkage with other stakeholders cross the border, and supported substantive implementation of cooperative activity in field. Joyner (2005, p. 104) mentioned 'Concept of partnership, which originated from 2002 World Summit on Sustainable Development (WSSD), involves the creation of voluntary, non-negotiated, multi-stakeholder, multilateral, and collaborative enterprises' in her journal, and expected that emphasizing all relevant partners including state, non-state and private sectors can make a contribution to addressing obstacles which transboundary environmental issues confront by mobilizing coalition of like-minded groups, which can act as better practical implementation devices.[23]

[23] See UN GAOR. *Toward Global Partnerships*. Rep. Vol. 60. 215. *UN Document*. Web. 22 Dec. 2005.<http://www.unglobalcompact.org/docs/about_the_gc/Towards_Global_Partnerships_Resolution.pdf>. See also UN DESA Division for Sustainable Development, World Summit on Sustainable Development. '*Plan of Implementation of the World Summit on Sustainable Development*. Rep. N.p., Apr. 2002. Web.

4.1.5.5.International organization

As for role of international organization in DSS problem solving, most responses are positive and answer that it is important to encourage international organizations and international financial groups to concern for DSS problem, and to participate into regime formation process.

In Korea, the international organization is largely considered as a mediator between different countries who have different perspective even on one problem. It is also expected for international organization to work as a mediator between state and non-state actors, mainly by interviewee from NGO.

Situation in Japan is similar with Korea, but one different thing is that expectation of financial support from international organization is mentioned in academia, especially in forestry side, and NGO. Also, one interviewee from government side is concerned about lack of self-reliance of Northeast Asia.

Both China and Mongolia also takes positive views of participation of international organization. NGOs in China consider expanded role of them in decision making process by accepting the third party, international organization, as a core member. The roles of international organization in bridging state, non-state actors and public and in supporting in finance are underlying in Mongolia. Due to the nomadic culture and lack of financial and technological capacity to build up real-time warning system by Mongolia itself, low interlinkage between state and non-state actor and between state and local people has became more serious. In that sense, international organizations' involvements with Northeast Asia is meaningful toward problem mitigation.

4.2. Comprehensive Result of the research

The purpose of this research thus far has been to analyze the reason why DSS regime has not been able to create in Northeast Asia. It also aims to identify the key driving force to promote the solution and to verify the indispensability to impose the traditional approach toward regime addressing DSS mitigation. Then, it makes a purpose to offer needs of developing new approach toward regime building and paradigm shift of traditional idea of regime. At beginning, the research asked the questions: What is the biggest obstacle for current countermeasures to solve DSS environmental problem? Does such obstacle have been mitigated by current countermeasures? In order to measure the reliability of hypothesis of probable regime to solve DSS problem, the questions are raised: How well have problem awareness and shared perspective been promoted among all-involved states? How deeply does DSS-involved stakeholders connected with economic interest? How well do current countermeasures and initiatives take a role to solve the problem? Is legally-binding regulatory system still recognized positively by DSS involved actors?

Through reviewing regime theory, first, the main body of this paper is initiated with the identification of three key factors for environmental regime building, which are political power, national interest and attribution of shared knowledge in regional level. This research analyzes how important these 3 factors are, and identifies which factor should be encouraged to build the solution of DSS problem in Northeast Asia. For this, it verifies 1) if powerful leadership exists, and the power distributes necessary roles to each actor and enforces members to concern joint interest the most, 2) how much and what kind of national benefits and damages can be expected through participating regime formation process, and 3) how much joint investigation for problem identification has been done in national and regional level and how strong knowledge sharing

system exist. Also, by applying Young's study on expected roles for effective regime –role as utility modifier, enhancers of cooperation, bestowers of authority, learning facilitator, role definers and agents of internal realignments, the research constructs a tool to analyze whether currently existing efforts take such roles in sufficient and activate the key factor which can be identified from previous finding is implemented. Here, 5 roles – utility modifier, agent of internal realignment, learning facilitator, cooperation enhancer and role definers among 6 are reflected to the analysis tool because of non-regime condition of current Northeast Asia. By seeking if current countermeasures take such roles in sufficient, the research expects to measure whether traditional approach toward regime is suitable to be applied to Northeast Asia.

In conclusion, a result that current countermeasures have low probability to perform the role as effective regime and to promote DSS regime is drawn (e,g,, Table 13). As findings of the survey, this research identifies largely 7 distinctive features in the regime formation process regarding DSS problem in Northeast Asia from interview and questionnaire survey -1) Lack of problem awareness and shared perspective in regional level 2) Lack of perspective in common interest 3) Low relationship between DSS and economic factor 4) Concentration on lack of awareness and knowledge factor 5) Low awareness of other initiatives 6) Low expectation for other initiatives' activities 7) Tendency of reluctance to promote regulatory regime and Growing influence of non-state actors - and try to find out the answers for research questions. These can be categorized into 5 groups in large. Started from first finding explaining 1) lack of problem awareness and shared perspective toward the one same problem, next 3 features shows 2) lack of concern in common interest, and 3) concentration more on knowledge and awareness factor than economic factor. The question about current national damage and benefits which are gained from DSS mitigation and the biggest obstacles to build regional cooperation describe that DSS

mitigation process has low direct connection with economic development. 4) Low efficiency and limitation of current countermeasures is considered as an appropriate regime formation process by verifying low awareness and expectation for exiting initiatives. Additionally, though there is no strong rejection to current countermeasures because of no harmful impact on national economy, the research found out tendency of reluctant to regulatory system. Therefore, the currently existing system cannot be an ideal model for encouraging cooperation. Toward cooperation building for addressing DSS mitigation, it refers to need of new model.

Utility Modifiers	Agents of Internal Realignment	Role Definers	Enhancers of Cooperation	Bestowers of Authority
✖	▲	✖	▲	✖
Result 2	**Result 1**	**Result 4**	**Result 4**	**Result 5**
Lack of interest in common interest	Lack of problem awareness/ shared perspective	Low awareness/ expectation of other initiatives	Low awareness/ expectation of other initiatives	Reluctant to Institution

Table. 13. Analysis whether current countermeasures can take the roles of regime

Taking into account the needs of sufficient problem awareness and common understanding, and increasing tendency of encouraging paradigm shift of regime, the research can conclude that: 1) It is accumulation of shared knowledge and understanding that is the key factor for DSS regime creation in Northeast Asia. 2) It is not indispensable to force the traditional concept of regime to apply to Northeast Asia. Progress on the talks among four countries has been slow, spending several years even merely for pre-negotiation studies. Despite the number of currently existing initiatives concerning DSS problem in multilateral level, their

reputations are not positive enough. Unless ruling parties of each government change their political structures to have better inter-ministerial condition, it would be hard to have even transparent data-sharing system for scientific consensus, which should be the basic step for further cooperation building. Therefore, for all the reasons given previously, the research is convinced that it needs to create new concept of regime. More specifically, the findings regarding tendency of reluctance to promote regulatory system, but supporting voluntary cooperation, and increasing transboundary linkage among non-state actors provide that the new approach toward DSS mitigation involves the characteristics of voluntary, flexibility and multi-stakeholders.

5. Conclusion

Northeast Asia faces challenging and complicated problems in environmental field, including acid rain, dust and sand storm, marine pollution, desertification and high levels of green house gas emission. In the area of DSS problem, governments in Northeast Asia region have acknowledged the existence of serious environmental problem and its transboundary characteristic, and need to have collective system of institutionalization. The countries have had bilateral and multilateral cooperative activities to study, monitor, and mitigate its transboundary impact on each country's environment, but such diverse existing mechanisms have been estimated negatively in terms of these practical results to build up regime.

This research concerns about why regimes are created in certain region for certain problematic issue but has not been able to create in Northeast Asia for DSS mitigation. With the aims to comprehend the reason of such failures and find out driving force of DSS regime creation, this research focuses mainly on questions 1) what is the key factor for encouraging all involved parties be cooperative to mitigate DSS problem, and 2) whether current approach can promote the development of such key factor and build cooperative regime addressing DSS mitigation, or instead of applying traditional regime to Northeast Asia, is it necessary to identify new model of regime toward sustainability of Northeast Asia. It is literature review and the survey through the interview and questionnaire that the research uses as main methodologies to find out the answers for the questions. According to literatures in the field of regime study, three key factors for regime creation are identified – such as political power, interest, and shared knowledge. In addition, it refers to Young's study about roles of effectiveness regime after having a partial modification in the light of non-regime condition on Northeast Asia – role as utility modifier, learning facilitator, role definer and agents of internal realignments-, which

became a standard to measure whether current efforts for regime building can take such roles and can promote the development of the key regime formative factor. This research involves the opinions not only from state government but also from non-state actors including scientific experts, business actor, NGO and international organizations via the interview, since it assumes that goal of DSS problem-solving cannot be established only by the governmental capability. The survey also covers the national diversity by contacting stakeholders in all-involved countries – Korea, Japan, China and Japan.

In conclusion, the foregoing analysis demonstrates that 1) lack of consensual and trusted knowledge is the biggest reason for non-regime condition on DSS issue, and 2) Northeast Asia needs for a new approach toward new regime model for encouraging such key factor and mitigating DSS problem. In traditional approach for international bargaining, nation-state is the only rational actor for building a regime, and it is compliance of each state with legally-binding regulatory system that the regime expects as a final goal. Much of previous literatures which are based on the traditional approach argue that the failure of regulatory system is largely because countries make decision based on the consideration on how much national interest they can get from problem solving efforts rather than how much problem can be solved. In contrast, this research argues that such traditional approach is not indispensable to promote DSS mitigation. Instead, it offers new approach which focuses on partnership among multiple stakeholders and deconcentration on regulatory goal.

Also, based on distinctive findings from survey, the research argues that DSS regime should be based on the integrated approach with multidimensional partnership which can transcend boundaries between state and non-state sectors, as well as between country and country, and also can enjoy the flexibility rather than being pressured by concrete legally binding

system. In this issue area, it's not available to force to build regulatory regime and to persist traditional system consisting only of sovereign state member. Rather, it offers a creation of 'community of interest network' embedding multiple-scaled key stakeholders including actors from not only government, but also from business, academia, non-government organization and public together into regime construction, utilizing non state communities knowledge for building consensual knowledge and problem understanding, and encouraging deliberative and meaningful dialogue toward sustainability of Northeast Asia in more practical way. Also, this new regime in Northeast Asia would be developed by involvement of international organizations. Through making further partnership with international organization, it's possible to expect to mitigate the conflict between country and country, and between state and non-state actor, as well as to get better financial support. In this manner, as a future direction, the paper suggests that deepening study on issue-linkage, which concerns on connection between DSS and other major issue of Northeast Asian environment – such as desertification and climate change –, is meaningful. Given its interdependence and interconnection among such issues, the efforts would be helpful to arouse the seriousness of the problem in global level as well as regional level, and make international organizations involve into the DSS issue. International organization has stronger capacity to harmonize a number of states and to encourage the regional cooperation (Chung 2010, p. 555).

Although this integrated approach with multi-stakeholders toward regime building is a relatively new, collaborative activities led by actors from different levels are significant to develop an effective environmental regime addressing transboundary DSS problem. Until recently, Northeast Asia has been dominated by strong nation-states leadership, but Miranda mentioned it 'has little trust of each other or experience in cooperative regional problem solving'

(2007, p. 116). According to her, different lenses provide different and important perspectives for consideration of the problem. Here, for the problem solving of DSS, it's time to move out from the traditional national contexts, and the perspective considering significant roles of diverse actors and linkage with other environmental issues are key to foster scientific consensus, which is the first step toward cooperative regime. Then, regime formation will become more reliable with adequate efforts both in state and non-state spheres, nationally and internationally.

CITED REFERENCES

黄砂問題検討会報告書. (2005, September). *環境省*. Retrieved June, 2011, from http://www.env.go.jp/air/dss/

泰信, 岩. (2006). *黄砂― その謎を追う*. 紀伊國屋書店.

憲次, 甲. (2007). *黄砂の科学 (気象ブックス)*. 東京: 成山堂書店.

Abbott K., & Snidal D. (2009). The governance triangle: Regulatory standards institutions and the shadow of the state (W. Mattli & N. Woods, Eds.). *The Politics of Global Regulation*.

Ahn, H. (2011). Regional Environmental cooperation regime in Northeast Asia - A case study on yellow sand storm problem-. *Korean Comparative Government Journal*, *15*(2), 103-128.

AIRIES. (2010). Desertification Control and Restoration of Ecosystem Services in Northeast Asia. *Global Environmental Research*, *14*(1).

Asian Development Bank (ADB). (2005, October). Prevention and control of dust and sandstorms in northeast Asia. - *Documents & Publications*. Retrieved from http://www.preventionweb.net/english/professional/publications/v.php?id=1565

Benn, S., Dunphy, D., & Martin, A. (2009). Governance of environmental risk: New approaches to managing stakeholder involvement. *Journal of Environmental Management*, *90*(4), 1567-1575.

Bernauer, T. (1995). The Effect of International Environmental Institutions: How We Might Learn More. *International Organization*, *49*(2), 351-377.

Brettell, A. (2007). Security, Energy, and the Environment: The Atmospheric Link. In I. Hyŏn & M. A. Schreurs (Eds.), *The environmental dimension of Asian security: Conflict and cooperation over energy, resources, and pollution* (pp. 89-113). Washington, D.C.: United States Institute of Peace Press.

Bull, B. (2008). Policy Networks and Business Participation in Free Trade Negotiations in Chile. *Journal of Latin American Studies*, *40*(02), 195-224.

Calder, K. E. (1998). Energy and Security in Northeast Asia's Arc of crisis. *IGCC Policy Paper*, (35), 5-16.

CCICCD. (2000). *China National Report on the Implementation of United Nations Convention to Combat Desertification and National Action Programme to Combat* (Publication). Beijing: UNCCD.

Chasek, P. S., Brown, J. W., & Downie, D. L. (2006). *Global environmental politics* (4th ed.). Boulder, Colorado [etc.: Westview Press.

Cheon, J. (1995). *Political Economy of Global Environmental Regime*. Seoul: Hanwool.

Chu, J. (2005, December). A Study on Innovational Measures of Environmental Cooperation Mechanism in Northeast Asia. *Korea Environment Institute*. Retrieved November, 2011, from http://webbook.me.go.kr/DLi-File/007/150652.pdf

Chu, J., Gang, G., Gang, S., Im, J., & Park, G. (2007). *Whangsa Daeung Jiyeokhyupryukchaejae Guchookaegwanhan Yeongu* (Rep.). Seoul: Ministry of Environment, Korea (MEOK)

Chu, J., Gang, G., Jung, H., Yoo, N., & Kim, M. (2003). *A Study on the Analysis of Damages from the Northeast Asian Dust and Sand Storm and the Regional Cooperation Strategies 1* (Korea, Korea Environment Institute). Retrieved from http://www.kdi.re.kr/infor/ep_view.jsp?num=66866

Chu, J., Gang, G., Jung, H., Yoo, N., & Han, H. (2004). *A Study on the Analysis of Damages from the Northeast Asian Dsut and Sand Storm and the Regional Cooperation Strategies 2* (Korea, Korea Environment Institute). Retrieved from http://naver.nanet.go.kr/SearchDetailView.do?cn=MONO1200404421&sysid=nhn

Chun, Y., Boo, K., Kim, J., Park, S., & Lee, M. (2001). Synopsis, transport, and physical characteristics of Asian dust in Korea. *Journal of Geophysical Research*, *106*(D16), 18461-18469.

Chun, Y., Oh, S., & Kwon, W. (2000). The Yellow-Sand Phenomenon and Yellow fog recorded in the Koryosa. *The Korea Journal of Quaternary Research*, *14*(1), 49-55.

Chun, Y. (2004-2006). *Research and Development on Meteorology and Seismology;Development on the Asian dust (Hwangsa) Monitoring and Prediction Techniques* (Rep.). Korea: Meteorology Administration.

Chung, S. (2005). *Environmental cooperation in Northeast Asia*. Jipmoon.

Chung, S. (2010). Strengthening regional governance to protect the marine environment in Northeast Asia: From a fragmented to an integrated approach. *Marine Policy*, *34*(3), 549-556.

Ci, L. (n.d.). Disasters of strong sandstorms over large areas and the spread of land desertification in China. In Z. Min (Trans.). Retrieved November 17, 2011, from http://www.unccd.int/search/search_results.php?query=Dust+and+sand+storm

Desombre, E. R. (2005). The Evolution of International Environmental Cooperation. *Journal of International Law & International Relations*, *1*(1-2), 90th ser., 75-87.

Dimitrov, R. S., Sprinz, D. F., DiGiusto, G. M., & Kelle, A. (2007). International Nonregimes: A Research Agenda. *International Studies Review*, *9*(2), 230-258.

Ernst, H. B. (1980). Why Collaborate? Issue-Linkage and International Regimes. *World Politics*, *32*(3), 357-405.

Haas, E. B. (1983). Words can hurt you; or, who said what to whom about regimes. *International Organization*, *36*(02), 27.

Haas, P. M. (1989). Do regimes matter? Epistemic communities and Mediterranean pollution control. *International Organization*, *43*(03), 377-403.

Haas, P. M. (1992). Introduction: Epistemic Communities and International Policy Coordination. In *International Organization* (1st ed., Vol. 46, pp. 1-35). Cambridge University Press.

Haggard, S., & Simmons, B. A. (1987). Theories of International Regimes. *International Organization*, *41*(3), 491-517.

Han, T. (2007). Characterization of regional environmental cooperation processes:comparison of Northeast Asia and Europe. In *Environmental Policy* (Vol. 15, Ser. 1, pp. 141-169).

Seoul: Korean Environmental Policy and Administration Society. Retrieved November, 2011, from http://academic.naver.com/openUrl.nhn?doc_id=36908520&linkType=outlink

Hand, S. (2009). *Northeast Asia Environmental cooperation and Mongolia-Desertification and Yellow Dust* (Doctoral dissertation, Seoul National University, 2008). Seoul National University.

Hasenclever, A., Mayer, P., & Rittberger, V. (2000). Integrating Theories of International Regimes. *Review of International Studies*, *26*(1), 3-33.

Hasenclever, A., Mayer, P., & Rittberger, V. (2000). Integrating Theories of International Regimes. *Review of International Studies*, *26*(1), 3-33.

Hass, P. M. (1993). Epistemic Communities and the Dynamics of International Environmental Cooperation' In *Regime Theory and International Relations* (pp. 168-201). Oxford: Oxford University Press.

Hidetaka, Y. (2010). Regional cooperation in Northeast Asia: Searching for the mode of governance. *International Relations of the Asia-Pacific*, *10*, 247-274.

Hwangsa (Rep.). (2003). Retrieved http://academic.naver.com/openUrl.nhn?doc_id=18304134&linkType=outlink

Institute for Global Environmental Strategies (IGES). (2009, January). *Tripartite Joint Research on Environmental Management in Northeast Asia* (Rep.). Retrieved http://enviroscope.iges.or.jp/modules/envirolib/upload/2253/attach/nea_report_final.pdf

Ishii, A. (2011). Scientists Learn not only Science but also Diplomacy: Learning Processes in the European Transboundary Air Pollution Regime. In R. Lidskog & G. Sundqvist (Authors), *Governing the air: The dynamics of science, policy, and citizen interaction* (pp. 163-194). Cambridge, MA [etc.: MIT Press.

Iwasaka, Y. (2003). Importance of dust particles in the free troposphere over the Taklamakan Desert: Electron microscopic experiments of particles collected with a balloonborne particle impactor at Dunhuang, China. *Journal of Geophysical Research*, *108*(D23).

Jho, W., & Lee, H. (2009). The structure and political dynamics of regulating yellow sand in Northeast Asia. *ASIAN PERSPECTIVE,*, *33*(2), 41-72. Retrieved April, 2012, from http://www.asianperspective.org/articles/v33n2-b.pdf

Joyner, C. C. (2005). Rethinking International Environmental Regimes:What Role for Partnership Coalitions? *Journal of International Law & International Relations*, *1*(1-2), 90th ser., 89-120.

Keohane, R. O. (1982). The demand for international regimes. *International Organization*, *36*(02), 325-355.

Kim, H. (2001). Message from the executive secretary economic and social commission for Asia and pacific [Foreword]. In *Global Alam:Dust adn Sandstorms from the world's drylands* (pp. 5-6). Bankok: United Nations.

Kim, I. (2007). Environmental cooperation of Northeast Asia: Transboundary air pollution. *International Relations of the Asia-Pacific*, *7*, 439-462.

Kim, Y. (2010). *Characteristics of Long-range Transport Aerosol by Transport Patterns in Northeast Asia* (Doctoral dissertation, Konkuk University, 2010). Seoul. Retrieved from http://www.riss.kr/search/detail/DetailView.do?p_mat_type=be54d9b8bc7cdb09&control_no=bd64ae5834ad0770ffe0bdc3ef48d419&naverYN=Y#redirect

Kim, Y., Kim, J., Kim, Y., Moon, G., Moon, G., Han, J., ... Gwun, S. (2003). Concentration Variations of Persistent Organic Pollutants in Gosan, Jeju during the Polluted Period in November 2001 and the Yellow Sand Period in Spring 2002. *Journal of Korean Society for Atmospheric Environment*, *19*(5), 469-490.

Kim, Y., Lee, H., Moon, Y., & Song, S. (2001). Environmental sciences : Bulletin of The Korean Environmental Sciences Society. *Environmental Sciences: Buelletin of the Korean Environmental Sciences Society*, *10*, 4th ser., 197-206.

Kim, Y., Park, I., Kim, C., & Kim, Y. (2007-2008). *Study on DSS generation mechanism and characteristic by movement route in Source region* (Rep.). Ministry of Environment, Korea.

Kimura, R. (2012). Factors contributing to dust storms in source regions producing phenomena in Japan from 1993 to 2002. *Journal of Arid Environments*, *80*, 40-44.

Kitschelt, H. (1992). Political regime change: Structure and Process-Driven Explanations? *American Political Science Review*, *86*(4), 1028-1034.

Korea, Korea Civil Aviation Development Association. (2003, February). Retrieved from http://www.airtransport.or.kr/eng/aiporder01.html

Krasner, S. D. (1982). Structural causes and regime consequences: Regimes as intervening variables. In *International Regimes* (2nd ed., Vol. 36, pp. 185-205). Massachusetts institute of technology.

Kurosaki, Y. (2011, October 29). What caused a recent increase in dust outbreaks over East Asia? *AGU - Over 90 Years of Quality Research in the Geosciences*. Retrieved December 22, 2011, from http://www.agu.org/pubs/crossref/2011/2011GL047494.shtml

Kwon, H. (2002). Effects of the Asian dust events on daily mortality in Seoul,Korea. *Environmental Res.*, *90*, 1-5.

Kwon, H. (2002-2005). *Health Risk Assessment of Asian Dust* (Working paper). Korea: Ministry of Environment (MOE).

Lee, C. (2002-2005). *Selecting the trees and establishing the pasture to control desertification* (Rep.). Korea: Korea Forestry Service.

Lee, J., & Kim, C. (2008). Analysis of spatial and temporal characteristic of recent DSS in source area. *Proceedings of the Korean Environmental Sciences Society Conference, 17*(1), 84-87. Retrieved from http://img.kisti.re.kr/originalView/originalView.jsp

Lidskog, R., & Sundqvist, G. (2002). The Role of Science in Environmental Regimes: The Case of LRTAP. *European Journal of International Relations*, *8*(1), 77-101.

Lim, G. (2006). *The development of a regional monitoring network for the improvement of Hwangsa forecastings* (Rep.). Korea: Seoul National University.

Litta, H. (2012). Methodology. In *Regimes in Southeast Asia: An analysis of environmental cooperation* (pp. 75-88). Wiesbaden: VS Verlag für Sozialwissenschaften.

Lu, Q., & Wang, S. (n.d.). Dust-sand storms in China: Disastrous effects and mitigation strategies. *FAO: FAO Home*. Retrieved December 10, 2011, from http://www.fao.org/DOCREP/ARTICLE/WFC/XII/0859-B5.HTM

Mahoney, J., & Snyder, R. (1999). Rethinking Agency and Structure in the Study of Regime Change. *Studies in Comparative International Development*, *34*(2), 3-32.

Matsumoto, K. (2003). Chemical properties and outflow patterns of anthropogenic and dust particles on Rishiri Island during the Asian Pacific Regional Aerosol Characterization Experiment (ACE-Asia). *Journal of Geophysical Research*, *108*(D23).

Ministry of environment, Japan (MOEJ). (2005). *Abstract of the Special Committee Report on Dust and Sandstorm Issues*. Retrieved from http://www.env.go.jp/en/earth/dss/051014.pdf

Ministry Of Environment (Japan). (n.d.). *Dust and Sandstorms* [Brochure]. Author. Retrieved May, 2011, from http://www.env.go.jp/en/earth/dss/pamph/pdf/full.pdf

Ministry of Environment of Korea (MOEK). (2008). Environmental Review 2007, Korea. *MOEK*. Retrieved from http://eng.me.go.kr

Ministry of Environment of Korea (MOEK). (2008). Environmental Statistics Yearbook. *Statistics Korea*. Retrieved from http://kostat.go.kr/portal/english/resources/2/1/4/index.static

Mitchell, R. B. (2002). A Quantitative Approach to Evaluating International Environmental Regimes. *Global Environmental Politics*, *2*(4), 58-83.

National Institute of Environmental Research (NIER) Korea. (1989-1991). Long-Range Transport of Air Pollutants and Acid Deposition 1,2,3.

NEASPEC. (2012). Review of programme planning and implementation: Implementing the regional master plan for the prevention and control of dust and sandstroms in North-East Asia. *NEASPEC*. Retrieved from http://www.neaspec.org/documents/som17/3.%20SOM17_DSS.pdf

S. (1997, April). Impact on manufactoring process of television tube by Dust and Sand Storm. *Kyunghyang Newspaper*, p. 23.

Science Council of Japan. (2010, February 25). *黄砂・越境大気汚染物質の地球規模循環の解明とその影響対策* (Working paper). Retrieved November 4, 2011, from Meteorological Society of Japan website: http://www.scj.go.jp/ja/info/kohyo/pdf/kohyo-21-h90-1.pdf

Shin, Y., Chung, J., & Yoo, J. (1999). *東北亞 環境問題와 地域環境協力의 摸索*. Seoul: Jipmoon.

Shrink, S. L., & Stankiewicz, M. (1998). ENERGY AND SECURITY IN NORTHEAST ASIA:FUELING SECURITY. *IGCC Policy Paper*, 35th ser., 1-3.

Squires, V. R. (2001). Dust and sandstorms: An early warning of impending disaster. In (pp. 15-28). Bangkok: United Nations. Retrieved November 14, 2011, from http://www.unccd.int/search/search_results.php?query=Dust+and+sand+storm

Squires, V. R. (n.d.). Distinguishing natural causes and human intervention as factors in accelerated wind erosion: The development of environmental indicators. Retrieved December 15, 2011.

State Environmental Protection Administration of China (SEPA). (2006). (Rep.). Retrieved from http://www.zhb.gov.cn/eic/649368268829622272/index.shtml.

Stein, A. A. (1982). Coordination and Collaboration: Regimes in an Anarchic World. *International Organization*, *36*(2), 299-324. Retrieved from http://www.jstor.org/stable/2706524

Takahashi, W. (2000). Formation of an East Asian Regime for Acid Rain Control: The Perspective of Comparative Regionalism. *International Review for Environmental Strategies*, *1*(1), 97-117.

UN DESA Division for Sustainable Development, World Summit on Sustainable Development. (2002, April). *'Plan of Implementation of the World Summit on Sustainable Development* (Rep.).

UN GAOR. (n.d.). *Toward Global Partnerships* (Vol. 60, Ser. 215, Rep.). Retrieved December 22, 2005, from http://www.unglobalcompact.org/docs/about_the_gc/Towards_Global_Partnerships_Resolution.pdf

UNCCD - United Nations Convention to Combat Desertification. (n.d.). Retrieved October 31, 2011, from http://www.unccd.int/

United Nations. (1992). *Chap.9 in Agenda 21: The United Nations Programme of Action from Rio*. Retrieved from http://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=23&menu=35

Ward, H. (2006). International Linkages and Environmental Sustainability: The Effectiveness of the Regime Network. *Journal of Peace Research, 43*(2), 149-166.

Wilkening, K. E. (2004). *Acid rain science and politics in Japan: A history of knowledge and action toward sustainability*. Cambridge, MA: MIT Press.

Won, D. (2003). A Study on the Interaction of Power, Interest and Knowledge = Asian Dust issue and Environmental Cooperation in Northeast Asia. *Journal of Asian-Pacific Affiars, 27*(3), 63-97.

World Meteorological Organization (WMO). (2012, April). WMO Sand and Dust Storm warning advisory and assessment system (SDS-WAS) science and implementation plan 2011-2015. *Sand and Dust Storm | WMO*. Retrieved from http://www.wmo.int/pages/prog/arep/wwrp/new/Sand_and_Dust_Storm.html

Young, O. R. (1999). *The effectiveness of International Environmental Regimes: Causal Connections and Behavioral Mechanisms*. The MIT Press.

Yu, Y. (2008). *Study on Sandstorm's Impact on Environment*. Retrieved from http://www.nies.go.jp/event/kaigi/tpm/tpm5/download/part1/session4/s4_2.pdf

APPENDIX

Questionnaire Form for Interview Survey: Korea, Japan, China and Mongolia

Country:

Occupation:

1. How serious impact DSS has made?

   Health impact:

   No Weak Neutral Serious Very Serious →

   Economic impact:

   No Weak Neutral Serious Very Serious →

   Transportation

   No Weak Neutral Serious Very Serious →

   Ecological Damage

   No Weak Neutral Serious Very Serious →

   Other ecological damage

   No Weak Neutral Serious Very Serious →

2. How many times have you ever felt DSS in a year? ( )

3. Do you think DSS is natural phenomenon or human-induced environmental problem?
   1) Natural Phenomenon ( )
   2) Human-induced Environmental Problem
   3) Both ( )

4. To deal with DSS problem, how have domestic countermeasures of your country made a progres s?
   Please choose more than one parts which has been developed the most.

① Institutional development
② Monitoring and Warning, Forecasting System
③ Reforestation and ecological recovery
④ Technical sharing (data-sharing)
⑤ Financial Resource finding
⑥ Improvement in public awareness (education, training etc)
⑦ Others ( )

Mainly by whom?

① Government
② Scientist
③ Business sector
④ NGO
⑤ Public
⑥ Others ( )

5. For Northeast Asia, to solve DSS problem at regional level, which actor can be a main leader? W hy?

① National Government (Governmental agency)
② Local Government
③ Non-State organization (ex: Scientist-policy maker-public) (Go to Question 7)
④ International Organization (ex: UNEP, ADB, WB, UNCCD etc)
⑤ Others ( )

Reason:

6. If you think national state is a powerful leader who encourages the regional cooperation for solvin g DSS problem, which country should have the biggest leading power? Why?

① Mongolia

② China
③ Republic of Korea
④ Japan
⑤ Others

Reason:

7. Among non-state organization, which actor will have the biggest leading power to encourage the cooperation to solve DSS problem in Northeast Asia? Why?

① Non-Government Organization (NGO)
② Scientist
③ Business sector
④ International organization ( )
⑤ Others ( )

Reason:

8. To deal with DSS problem, how to make a further progress in domestic countermeasures of your country? Please choose more than one parts which need to focus more from now on.

① Institutional development
② Monitoring and Warning, Forecasting System
③ Reforestation and ecological recovery
④ Technical sharing (data-sharing)
⑤ Financial Resource finding
⑥ Improvement in public awareness (education, training etc)
⑦ Others ( )

Mainly by whom?

① Government
② Scientist
③ Business sector

④ NGO
⑤ Public
⑥ Others ( )

9. What do you think about the opinions blow:

9-1) Building a legally-binding environmental institution in multilateral level is important to solve DSS problem in Northeast Asia.

Not important Little important Neutral Important Very important

9-2) Instead of legally-binding institutionalization, it's more effective to encourage the voluntary-basis participation.

Not important Little important Neutral Important Very important

Reason:

10. Please choose the actors who need to work together to deal with DSS problem.

① Central Government (state agency)
② Local Government
③ Scientists
④ Business
⑤ NGO
⑥ Others ( )

Reason: ( )

11. Do you think how much interlinkage among these actors have been made in current?

No A little Neutral Good Very well

If you choose the level under neutral, why? ( )

If you choose the level above neutral, is it linked domestically or internationally (regional level)?

① Domestic
② Regional (Among (between) which countries?)
(Specific Name of the activity or community)

Please choose the actors who currently work together to deal with DSS problem.

① Central Government (state agency)
② Local Government
③ Scientists
④ Business
⑤ NGO
⑥ Others ( )

12. Do you know what kind of cooperative efforts (bilateral/ multilateral) to deal with DSS does Northeast Asia have in current?

① TEMM
② NEASPEC
③ NEAC
④ ECO ASIA
⑤ Others ( )

13. Do you think they are working well?

Yes No

No A little Neutral Good Very well →

If not, why? ( )

How to amend? ( )

14. How important is making interlinakage (communication) among different actors in order to solve DSS problem in Northeast Asia?

Not important Little important Neutral Important Very important

15. Do you think the role of international organization is important to encourage the DSS environmen tal cooperation in Northeast Asia? Why?
Not important Little important Neutral Important Very important

What kind of role do you respect for International organization?

① Financial Resource (support)
② Mediator among various countries
③ Mediator between state and non-state actors
④ Others ( )

16. Through participating the regional cooperation to solve DSS problem, what kind of benefits your country can expect to gain? How important?

① Political benefit ( )
Not important Little important Neutral Important Very important

② Economic benefit ( )
Not important Little important Neutral Important Very important

③ Ecological benefit ( )
Not important Little important Neutral Important Very important

④ Health benefit ( )
Not important Little important Neutral Important Very important

⑤ Others ( )
Not important Little important Neutral Important Very important

17. What is the biggest problem to solve the DSS problem in Northeast Asia?

① Lack of common awareness about the problem (Lack of scientific data)
② Lack of willingness to solve the problem
③ Unstable Financial resource
④ Political/ Economic interest
⑤ Historical hostility
⑥ Others ( )

18. What kind of measures can be considered to encourage the regional cooperation?
( )