

Dynamic Climate Change Adaptation in Nomadic Lifestyle and its Implications

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유목문화 기후변화 적응의 역동성과 그 함의

최충익

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국문 요약

중앙아시아지역의 기후변화적응 이슈를 유목문화의 역동성 측면에서 접근하고 있으며 이를 통해 중앙아시아 지역의 기후변화특성에 적응하는 개도국 기후변화 정책수립 이슈를 다루고 있다. 건조하면서도 혹한과 혹서가 반복되는 중앙아시아 지역의 기후특성은 지구촌 어떤 곳보다 기후변화로 인해 심각한 영향을 받고 있다는 문제의식에서 출발하고 있다. 기후변화 영향에 적응하는 유목문화적 역동성(dynamics) 요소를 수자원(water resource), 가축(livestock), 초원(pastureland)을 중심으로 살펴보고 있으며 유목민의 문화적, 기후적 특성에 기초한 적응정책을 탐색하고 있다. 아울러 기후변화 영향 및 적응에 있어서 중앙아시아 지역의 유목문화적 특성이 갖는 이중적 의미로, 오랜 기간 잦은 이동과 새로운 환경에 적응해온 유목민들의 라이프 스타일이 기후변화에 있어서도 우수한 적응 잠재력을 발휘할 수 있음에도 주목하고 있다.

■ 주제어 ■ 유목문화, 기후변화 적응, 중앙아시아

Abstract

This aim is to explore the change of lifestyle caused by climate change and develop available adaptation policies against climate threats in Central Asia with the perspective of nomadism, which depends entirely on natural ecosystem. This article also attempts to pinpoint the dynamics between nomadic lifestyle and adaptation options for the resilience of nomadic community against climatic change threats. The adaptation options and opportunities as well as the impacts of land use change and nomadic pastoralists' lifestyle caused by climate change cannot be overemphasized. We suggest that nomadic lifestyle may aggravate the degree of vulnerability to climate change threats, whereas the capacity of nomad to successfully adapting to new environment in developing countries can be superior to that of settler lifestyle in one place in developed countries.

■ Keywords ■ Nomadic Lifestyle, Climate Change Adaptation, Central Asia

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I . Introduction

The whole world has been confronting climate change threats. The climate may change either slowly or rapidly, and many changes may be irreversible and impossible to forecast accurately (Adger et al., 2009). Therefore, governments, scientists and scholars of the nations are posing great importance on the researches related to natural disaster phenomenon derived from global warming, climate change impacts and ecological crisis. "Giddens's paradox" points out that dangers caused by global warming are neither tangible nor immediate or visible in our daily life. Thus, many people will do nothing about responding to real issues of climate change in the early phenomenon. However, when the dangers of climate change become tangible and noticeable being stirred to serious actions then it will, by definition, be too late. Hence, it is deeply important to recognize the seriousness of climate change impacts in the most initial period before it is too late and consider it as the front-of-the-mind issue rather than the back-of-the-mind one (Giddens, 2009).

The sustainable development in Central Asia (CA) depends greatly on the tight links between the natural environment and the economy more than other countries. A significant portion of the economic activity has always targeted on natural resources such as pasture, animal husbandry, agricultural land and water resources, which are the basis of nomadic lifestyle in CA. With the rising temperature due to climate change impacts, the serious consequences place significant challenges on nomadic pastoralism in CA. The countries of CA are seriously confronting the drastic environmental changes, which are combined with some specific contexts which stem mainly from features of geographical and climatic conditions. Climate change of this region would widely affect ecosystem, natural pasture, arable farmland, animal husbandry, water resources and soil quality. Therefore, climate change adaptation issues of CA will be tackled with a high priority concern rather than mitigation issues, which deal with the reduction of greenhouse gas emissions.

The climate change impacts such as harsh climatic conditions already appear in sight here and there in CA and other visible evidences demonstrate that ecosystem has been getting unstable (GOM, 2003). Since the country like a Mongolia is located in the transition area between the Siberian taiga and the Central Asia desert, it is more sensitive and vulnerable to climate change impacts. Hence, the livelihoods or rural residents of Mongolia may be under a desperate situation in urgent need of taking some measures against climate change (Gomboluudev, 2008). In particular, rural communities are more threatened by the risks derived from extreme climate events such as longer droughts and harsh winters than urban area.

Climate change adaptation is being magnified as a critical issue in Central Asia to be taken into a serious account, which may radically change and threaten the traditional nomadic lifestyle. Developing countries of Central Asia start to have great concern on adaptation issues and positively respond to the negative impacts of climate change (Mijiddorj, 2010; Dagvadorj et al., 2000)

In a sense, nomadic lifestyle may aggravate the degree of vulnerability to climate change threats, whereas the capacity of nomad to successfully adapting to new environment in developing countries can be superior to that of settler lifestyle in one place in developed countries. Although they are more vulnerable to climate change partly because they are alienated and poor and have little access to information and high technology, many years ago they have adjusted their migration patterns and switched to more resistant strains of drought, livestock and pasturelands. In this article, the adaptation dynamics of nomadic lifestyle can be regards as the forces that produce change against climate change threats.

There has been a paucity of study with climate change adaptation, needless to say nomadic adaptation dynamics (Leary et al, 2008; Fay et al., 2010). So far, the related studies on adaptation issue have been constrained by a lack of concerns. In this regard, this study aims to explore the change of lifestyle caused by climate change and develop available adaptation policies against climate threats in Central Asia with the perspective of nomadism, which depends entirely on natural ecosystem. This article also attempts to pinpoint the dynamics between nomadic lifestyle and

adaptation options for the resilience of nomadic community against climatic change threats. The adaptation options and opportunities as well as the impacts of land use change and nomadic pastoralists' lifestyle caused by climate change cannot be overemphasized (Choi, 2012).

II. Research Framework

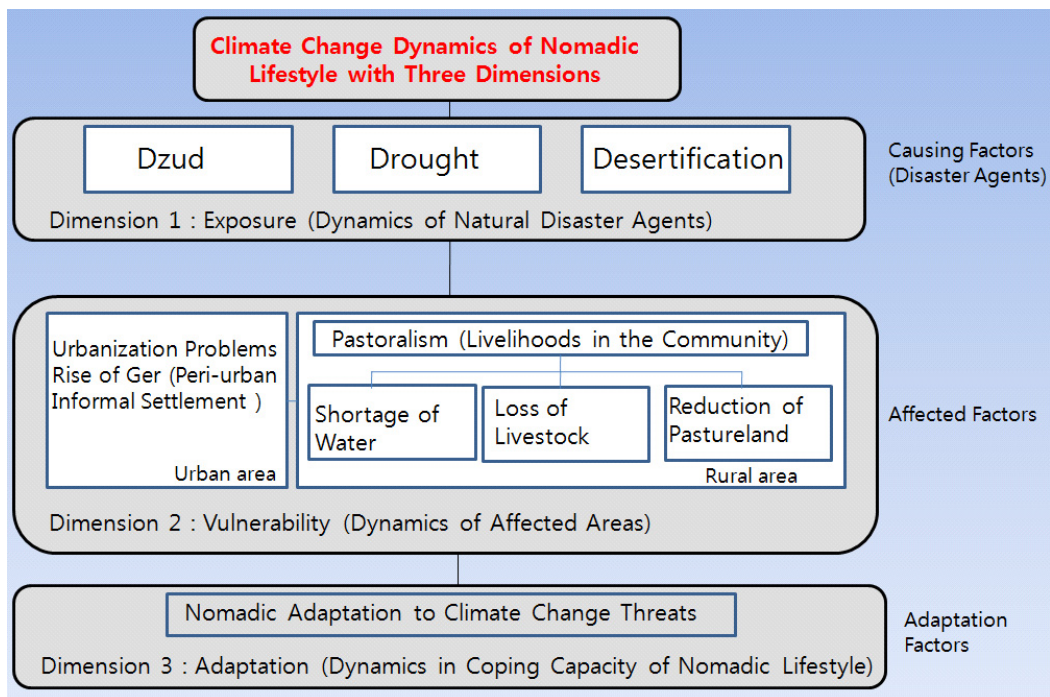
When it comes to the research framework, this paper is grounded on three dimensional approaches of IPCC methodology: exposure, vulnerability and adaptation capacity (IPCC, 2007). Three main factors would be considered for the exploration of climate change dynamics in terms of nomadic context. One dimension is indicative of causing factors that is composed of disaster agents, which would be exacerbated by climate change. Dzud, drought and desertification are regarded as the key driving agents in Central Asia. The exposure to these natural disasters is adversely affecting rural and urban area, which may be triggered and intensified by climate change impacts. Hence, exposure dimension is related to the dynamics of natural disasters produced by climate change.

Another dimension refers to vulnerability and is considered as affected factors that are mainly connected with pastoralism in rural area as well as urbanization in urban area. The nomadic people in the rural community are highly dependent on pastoral livestock herding and water resources, which tends to make rural lifestyle extremely vulnerable to climate variations compared to urban area (Adger et al., 2009; Leary et al., 2008). Thus, vulnerability dimension is strongly based on the dynamics of the features of affected area: urban area or rural area. It starts with multi-dimensional baseline of vulnerability including vulnerable groups, socio-economic characteristics, natural resources and institutional processes of adaptation.

The third dimension represents adaptive capacities against climate change threats. It refers to the positive perspective of nomadic community that may mitigate the

risk posed by natural disasters. It also looks to the possibility that the nomadic lifestyle is highly vulnerable to extreme natural events, whereas the coping capacity of nomadic lifestyle may provide adaptive potentials against unexpected events. Figure 1 shows the schematic diagram on climate change dynamics of nomadic lifestyle with three dimensions.

Figure 1 Research Framework



The study employs a Focus Group Interview (FGI) method to explore dynamic climate change adaptation in terms of methodology. FGI method is a form of qualitative interviewing approach that uses a researcher-led group discussion to generate data (Bloor, 2001). It could have the merit of widespread availability for academic survey research, especially incases that involved previously unexamined subjects (Stewart, 2007). The application process of FGI will be discussed in detail later.

III. Dynamics of Nomadic Lifestyle's Vulnerability

1. Dynamics of Disaster Agents Exacerbated by Climate Change

Natural disaster places serious impacts on nomadic lifestyle, eventually leading to much inconvenience to national economy and environmental deterioration. Most of countries in Central Asia (CA) are particularly vulnerable to climate change due to its geographic location, sensitive ecosystems and poor socio-economic condition. Moreover, ecosystems have been notably altered and disturbed by disaster agents as a result of climatic variability. The environmental changes usually include harsh dryness, lack of water and bitter cold. In this context, dominant disaster agents in Central Asia may be classified into dzud, drought, and desertification.

Dzud is an indigenous term used in Mongolia. The dzud is a sort of long-lasting phenomenon meteorologically caused by natural factors; temporary or long-lasting heavy snowfall, severely low temperatures, strong windstorms that often frustrate animals to look for fodder. When a dzud occurs in the winter, people as well as livestock have hardly any access to grazing, which may cause a serious food shortage problem. Hence, a dzud may often be connected to livestock famine, and the death of many animals due to hunger, bitter cold and exhaustion. It also poses a higher risk on human life in CA. The larger scale a dzud has, the longer duration it has, which often leads to the higher the mortality rate of livestock (AIACC, 2006). Depending on characteristics, factors and causes, forms of dzud are diverse and dynamic, which make it difficult to cope with dzud risks in CA.

Dry weather conditions have worsened rapidly in the last decade. The frequency of drought has increased significantly by almost 95 per cent compared to the last 60 years (Anna, 2009). In Mongolia, the worst droughts harassed the whole country for the summer season of the range from 1999 to 2002, which affected approximately 50-70 percent of the total population. It is also reported that about 3,000 drinking water sources including 680 rivers and 760 lakes have dried up (Batima et al., 2005). Such environmental degradation has adversely affected the level

of primary production of plants and available water resources, which maintain livestock as well as human life. The drought in Mongolia was not regarded as a natural disaster, unlike in other Southeast Asian countries, which have not experienced severe drought and so are not familiar with the low rainfall. It is all because the drought phenomenon happens more often than not in Central Asia (CA), which originally has low precipitation due to geographic location. Drought usually results in the decrease of pasture plants. It also has destructive power to reduce water availability and cause the absence of grass on pasture. In many cases, drought prevents herders from preparing hay and other supplementary food for animals as well as dairy products for human lives (Borgford-Parnell, 2009).

Desertification is evidently remarkable all around Central Asia, and also is one of the most significant factors bringing forth the ecosystem vulnerability to climate change (Batjargal, 1992). The main climatic factor that causes desertification involves intensive wind, by which 30-35 tons of soils have been lost for the past 30 years (UN, 1994). A large portion of the land in CA is also degraded seriously due to heavy rain as well as frequent strong wind. In 1991, the hurricane with strong winds of 140-160 km per hour removed fertile soil layer in a wide range of areas of the southern Mongolia in only a few hours (Batjargal, 1992). To make matters worse, extreme grazing and human settlements on pastureland aggravate water shortage and desertification. The environmental carrying capacity of pastureland is very often exceeded in the grazing areas, resulting in the degradation of plant species ecosystem and soil erosion that eventually leads to desertification. Desertification also produces dynamics due to a wide range of impacted area; dust storms in CA are affecting as far away as East Asia.

Climate change has different sides in terms of impacts' dynamic: positive and negative. In a sense, global warming would bring some benefits to the countries that have endured harsh weather so far. These benefits include, for example, milder climates and more pleasant temperatures which will lead to a decreased need for energy consumption. In contrast, intensified impacts, which spring from the climate change, would be worse and make people more vulnerable to natural disasters. It

is notable that the benefits would be easily outweighed by the negative impacts derived from climate change threats.

2. Nomadic Lifestyle's Vulnerability to Climate Change Threats

Climate change tends to place a heavy stress not only on the natural environment system, but also nomadic lifestyle (Gomboduulev, 2008; Anna, 2009; Boldgiv, 2009). Extreme climate events can bring severe impacts onto its socio-economic systems, potentially as well as the irreversible damages to natural environmental system. Agriculture, livestock and water resources are among the most vulnerable systems, to say nothing of species diversity (AIACC, 2006; Batima et al., 2005). In this respect, dynamics of nomadic lifestyle vulnerability to climate change in CA may be identified as three key perspectives water resources, livestock and pastureland, which would be called nomadic circulation.

Shortage of Water

Water and animal fodder availability is drastically changing and deteriorating, which is undermining pastoral socio-ecological systems in Central Asia (CA). CA has limited water resources due to the geographical features. Seasonal precipitation pattern has been dramatically changing owing to climate variation. There are also evident changes related to human phenology; thin spring ice, ice cover duration, and ice thickness change of rivers and lakes. The main source of water in the region comes from the rising temperatures in the autumn and spring season (GOM, 2003). The water level in some lakes and rivers has dramatically decreased particularly in the areas with an insufficient input of glaciers. The groundwater table surface also is diminishing in the dry regions, and degradation of land cover owing to the shortage of rainfall has been exacerbated. It is evident that global climate change is going to impose serious impacts on regions' lifestyle. The desert steppe may be gradually affected by desertification. In this regard, Erdenetsetseg(2002) points out that "Vegetation areas will shift further northward, reducing forest cover and fertile

alpine vegetation. Shifting vegetation in stationary protected areas will cut down the size of suitable habitat in the protected areas."

There have been drastic changes within a short period. Basin's degradation through soil erosions and a drastic urbanization is a key factor for surface water runoff problems in addition to climate change impacts (Batima et al., 2005). The climate of Central Asia is cold, with an annual mean temperature of minus 0.8°C. Snow cover plays a two-sided role for the balanced ecosystem. Snow provides insulation to protect the deep soil that remains frozen, acts as a water source for herdsmen, wild and domestic animals during the winter, and nourishes the rivers and lakes in the spring season. However, if there is heavy snowfall, a white dzud occurs, which results in no food being available for the herds. In case of no snowfalls, a black dzud occurs, resulting in a lack of drinking water for herds.

The amount of snowfall produces adaptation dynamics in the community, especially rural lifestyle based on nomadic activities. Hence, it plays an important role in nomadic lifestyle based on livestock herding, simultaneously it serves as drinkable water resources for animals in winter. So, less snow will be able to make nomadic life based people more vulnerable to adapting to the environmental degradation by climate change impacts.

Loss of Livestock

Animals take the necessary energy and nutrients for growth in summer and autumn. Thus, animals start to put on much weight in early summer when good quality grass is available and reach their maximum point of weight in late fall. If there is dry summer or prolonged drought, animals cannot build sufficient strength and energy to overcome winter, eventually leading to plenty of dead animals due to malnutrition. Animals do not die even during very severe drought conditions. Most importantly, animals are unable to generate the necessary energies in their bodies during the summer drought period, so that they do not have enough immunity system to overcome the cold winter, eventually leading to the large

number of animal death.

The extreme weather often has dramatic impacts on animals and the livestock sector because of harsh dryness (AIACC, 2006). Moreover, climate change influences directly or indirectly animal husbandry productivity and efficiency through pasture alteration. What is interesting is that the climate change could also be advantageous to animal body heat preservation and breeding. Livestock adapted properly to the natural climate condition and has maintained high productivity level when in open pastures that depends on normal climate and weather conditions. Negative impact of changing grassland and weather situations, especially during harsh winter and spring seasons, will definitely reduce productivity and quality, and would result in loss of livestock (Anna, 2009).

Many natural environmental factors affect the growth, reproduction, productivity and vitality of livestock, which would be entangled in the change of animals' weight. Consequently, the careful observation of animal's weight change need to be made to solve many problems related to climate and ecological changes. Climate change places a negative impact on pastoral livestock, leading to the reduction of livestock productivity as well as the inefficiency of animal husbandry. It is reported that the time for sheep, goat and cattle to be shorn was shifted seven days ahead for the past 20 year period. What is worse, livestock losses occur every winter season, resulting in high rate of deaths during a dzud (Bolortsetseg, 2002).

Livestock production is the major source of income of pastoral households. Hence, livestock would be regarded as the basis in rural economy system in CA. In addition to the provision of major nutritional source, livestock is widely bartered in exchange for all kinds of non-animal products in the market. So, the financial capability of households depends directly or indirectly on the livestock population they keep. Once a dzud arise, a large number of herders usually have to lose a considerable portion of their livestock, which means simultaneously that there will be not food and not cash with them anymore. In this regard, whether it is timely precipitation with a proper amount produces adaptation dynamics not only in rural community, but in the urban community which depends on livestock.

Reduction of Pastureland

The pastoral livestock directly affects half of the whole population and indirectly influence the supply of food and clothes to the other half in Mongolia. Livestock-related exports amount to approximately one-third of the total earnings of foreign exchange. It reflects that national development is significantly dependent on pastoralism. Hence, pastureland sustains not only livestock activities and subsistence farming in rural community, but also the national economy of the country. Thus, pastureland is regarded as the key resource of nomadic animal husbandry.

MNETM(2006)reports that the pastureland comes to 116 million hectare, which forms 73.9% of total land. There exist grazing 33 million domestic animals livestock. Nature and composition of the pasture fully depend on the features that each natural zone originally has (MNETM, 2006). Approximately 80 percent of Mongolia's total land area or 127,307,000 hectares are used for pasture (Bolortsetseg, 2002). Pasture growth begins in late April and biomass peak is usually reached in August. Livestock obtains over 90 per centof its annual feed intake from the annual pastures. In winter, the grass dries off and its quality deteriorates. During this period, the animals take only 40-60 percent of their daily feed requirements. Pasture yields are strongly affected by climate variation and weather conditions. The dynamics starts with drastic change of pasturelanddue to climate change.

Climatic conditions that prevent animal from grazing are projected to increase in both summer and winter seasons. Unfavorable conditions are likely to increase in the eastern and central steppe as well asin the north-western mountainous region. Due to global warming and increased drought frequency, land has been steadily worsening, while the biomass has been reduced. Non-edible species are gradually replacing edible ones, eventually leading to the total decrease of coverage and biomass (Anna, 2009).

The dynamics of nomadic lifestyle's vulnerability lie in the facts that the lifestyle is likely to be disturbed and to lose equilibrium due to climate change (AIACC, 2006). The increasing temperature and lack of precipitation related to climate change

tends to augment the frequency and intensity of climate fluctuation and extremes. It is coming true that climatic variations have exacerbated drought, dzud and desertification, which may worsen nomadic lifestyle vulnerability. Adaptation dynamics with nomadic lifestyle is facing the new situation with increasing uncertainty due to climate change.

IV. Dynamics of Urbanization and Nomadic Adaptation to Climate Change

1. Is Urbanization the Driver of Climate Change Vulnerability?

This dramatic increase in population is likely to bring forth extra demand for energy and food production. The increasing population may impose heavy strain on the natural and human environment system. The significant impacts on both livelihoods and ecosystem have already come into sight. In Mongolia, there have been critical issues regarding careful consideration of rapid urbanization, particularly in ger areas, which means sorts of peri-urban informal settlements of Ulaanbaatar city. In the past few decades, the city have experienced widely due to the migration to urban areas. This unprecedented urban expansion gave rise to many socio-economic problems, including economic issues, infrastructure and environment besides climate change threats.

Many countries of Central Asia (CA) have a unique nomadic culture of moving from one place to another in the four seasons. Nomadic lifestyle based on pastoralism and urbanization with the rise of ger, are two different key cultures. Nomadic life may not provide traditional nomads in new urban life with an adaptation to climate change threats.

There would be two characteristics of urbanization in CA compared to that of other developing countries. First, unique residential type ger have led the population increase bringing about urban sprawl in the process of urbanization. It

is notable that geris not different from ghetto, in which many poor people with particular races and religions live apart from other people. Ger is not necessarily the residence type only for the poor. Second, Ger has the regional specific context within each spatial hierarchy. Most of the expansion took place in the low-income areas, where basic infrastructure services are poor or non-existent. (Choi, 2012). Urbanization in CA can be significant drivers of climate change risk and are connected with vulnerability creation of regional community.

2. The Dynamic Adaptation against Climate Change in Nomadic Society

The dynamic adaptation in CA starts with understanding regional specific features, which derive from economic status, environmental and cultural context in the nomadic community of rural area. Overcoming climate change vulnerabilities can be constructed that take into consideration sources of environmental, social, and economic marginality (Wisner et al., 2003). This strategy includes the exploration of the linkage between nomadic communities and regional environmental services, and ecosystem vulnerability.

Conserving Pastureland

Pastures function as the fundamental natural resource for the production of livestock in rural society of CA. Sustaining and improving pastureland would be important for future livestock production as well as the enhancements of rural livelihoods. The development of a variety of options to conserve and improve pastureland is indispensable and in urgent need for the sustainability of nomadic lifestyle in rural area. The plantation of drought resistant crops needs to be considered for the adaptation to harsh dryness, while the effective grazing management system is necessary to keep pastureland fresh and stable.

The drastic changes in natural environmental system would be mainly induced by human activities (Giddens, 2009). Central Asia is facing serious challenges to maintain sustainable development, which includes the technological developments

of pastoral animal husbandry and agriculture sector (Batima et al., 2005; Adger et al., 2009). Therefore, the balanced policy and strategies for protecting pastureland need to be established to meet the rising demands for improved agriculture production as well as the environmentally sustainable development.

Due to the geographical shift in the agricultural land base, pasture availability and arable land development could be changed, and some farmers may gain a benefit of locally improved yields, whereas others may suffer from high cost to adjust the current farming. Even though agricultural activities such as animal husbandry and arable land development have adapted continuously to the risks associated with climate variability, the government's efforts to cope with climate change need to be made to increase the diversity of plant species and innovate the technologies in the rural society based on pastoralism.

Protecting Livestock

The first step to preserve livestock is to scrutinize and monitor the direct and indirect impacts on livestock and meat productivity due to climate change. Close examination may help to shed light on the critical issues derived from animal livestock problems. Moreover, the land use change monitoring as well as agricultural technology improvement may be helpful to upgrade climate change response of nomadic community in the level of local government.

Some legal actions against climate change threats need to be set up for enhancing the adaptation capacity of pastoralism based on the raising of livestock, which is the dominant economic activity in CA region. It is necessary that institutional measures keep up with rapid environmental changes to preserve pastureland (AIACC, 2006; Anna, 2009). To effectively adapt to the climate change, it is expected that the livestock do not exceed the carrying capacity of the pastureland. Livestock control by the pasture capacity is essential not only for the protection of livestock, but for sustainability of human life.

With growing impacts of climate change, the increasing extreme events are a

significant barrier to livestock sector development. Hence, it is essential to recognize and maximize the substantial links between nomadic adaptation improvement of the livestock in the level of local governments and national adaptation capacity in the level of central governments. To effectively adapt to changing environment, it is in urgent need to introduce high productive cross-breeds and develop supplementary feeding in rural community.

Developing Water Resources

The climate change has been worsening the competition for water source in water-limited region which can adversely affect the welfare of people. When it comes to the shortage of water resources for climate change adaptation, the up-to-date information on drastic environmental change need to be quickly built and the assessment of critical changes in permafrost area, rivers, lakes and snow cover should be monitored expeditiously and adequately.

Water resource plays a vital role in the rural community. Since climatic variations are subject to alter the quantity and quality of water resources, both the quality of soil fertility and species diversity of plants are strongly influenced. Hence, it is keenly necessary to update its integrated resource water supply, which entails the comprehensive evaluation of water supply needs as well as the improvement of irrigation system of supporting nomadic lifestyle in the rural community; use of marginal water, new irrigation facilities, supplemental irrigation, etc. (AWWA, 2010).

Enhancing Livelihoods

Even minor changes in climate are liable to severely affect the daily routine of rural community and lead to the drastic decline of industrial efficiency in CA (Bolortstseg, 2002). Although the traditional culture based on pastoralism and animal husbandry holds some capacity to adapt to its environment and climate change for the past several hundred years, it would be undeniable that the recent

climate change is still posing great dangers on traditional nomadic life pattern. Hence, MNETM (2006) maintains that climate adaptation policy have to reflects some country-specific circumstances and regional concerns. Nomadic lifestyle and economic activity as well as geographical and climatic conditions are taken into proper consideration for improvement of livelihoods.

On one hand, the crucial option for the enhancement of the livelihood in the rural society is to improve and upgrade traditional pastoral systems. On the other hand, it is notable that the traditional way for herder's life would bein itself an indigenous option for the effective response of climate change threats. The promotion of collective communities would be effectual and available tools for protecting pastureland and reducing the climatic impacts. The community-based adaptation would be a sort of community supervision strategy. The rural community may make decisions on how better to share the regional resources based on its indigenous information to cope with the various threats caused by climatic variations.

Improvement of awareness and institutional system

Since it would cost much to develop countermeasure and cope with climate change, it is appropriate that governments are in charge of the responses to climate change. Hence, each level of government has to search and share regional specific information that rural or urban community society has.

When it comes to the driving strategies and institutional systems on climate change adaptation, vulnerable regions and countries have to be well equipped with environmental facilities as well as socio-economic system to effectively adapt to potential risks of climate change (GOM, 2003; Choi, 2012). The integrated strategies are strongly stressed with regard to the climate change policies, which include not only institutional and legislative action, but also education and public awareness improvement. Education and training for young herders can be prepared for proactive adaptation.

Nonetheless, it still lacks the balance and harmony between central counter plans

and local counter plans (MNETM, 2006). There are hardly the programs that consider the situation of nomadic adaptation to climate change. In spite of the impending risk, regional based actions are still in urgent need.

Diverse adaptation options are including the change in fertilizer amount, education and increase of awareness of herdsman and conservation of natural water resources. It would seem difficult to implement regulation policy on the number of major livestock according to pasture availability and river runoff situation, which may cost rural community much money and bring about social barrier. Further identification of adaptation strategies is required for providing economic, social, technical and environmental sustainability and minimizing uncertainties. It is necessary to have a regional specific approach with the better understanding of the climate change mechanism in the perspective of nomadic adaptation.

Which option has high priority? What should we consider first? Almost all countries of Central Asia have been suffering budgetary deficit. They may not have enough power and willingness to take measures against climate change. This is the reason why we have to understand the dynamic situation surrounding climate change adaptation issues.

Resilience in Nomadic Lifestyle and Potentiality of Climate Change Adaptation

It is argued as before that the variations in climatic conditions brought forth significant challenges to nomadic pastoralism. The process of assessing the impacts of land use change in terms of nomadic pastoralist needs to be implemented to improve the resilience of natural ecosystems in CA regions, which is confronting climatic variability that threatens water resources, livestock and pastures.

What should be implemented for development of the water resources against the drought due to climate change? What steps should be taken for strengthening animal bio-capacity to cope with adverse impacts of climate change threats? What measures should be conducted by the herders to ensure better management to enhance the livelihood of rural community? It is necessary that the identification of

adaptation options be focused on setting priority among adaptation policies: conserving pastureland, protecting livestock and developing water resources.

Pastoralists are able to try to plant drought tolerant crops on previous grazing land, where has been destroyed by drought. These crops include pistachios and fodder barley which can be used to feed livestock. Community-based adaptation policy development against climate change threats need to be highlighted in the perspective of nomadic life.

Climate change adaptation of nomadic life in CA is dynamic. It is true that nomadic culture and scattered population may impede the prompt access to up-to-date information during a crisis. In a sense, the nomadic lifestyle to move freely may allow people and animals to avoid exploiting a wide range of natural and man-made habitats in one place. Nomadic people may have some potentialities in their behaviors to expeditiously adapt to the changes of natural environment by adjusting their migration routes and time away from disturbed and degraded zones. In this respect, nomadic people will be able to get valuable lessons from nomadic life style about environmental sustainability in person. National actions alone cannot improve the adaptation capacity of nomadic life in rural area against climate change threats. It is notable that policy flexibility to maximize the citizens' adaptation capacity will be considered in terms of nomadic lifestyle without overburdening its already fragile environment (Borgford-Parnell, 2009). Dynamic climate change adaptation of nomadic lifestyle needs to be in harmony with sustainable development in CA. There are possibilities that nomads are superior to urban settler in successfully adapting to climate change risks.

Table 1 shows the available options for dynamic climate change adaptation of nomadic lifestyle with three dimensions, which is based on the aforementioned schematic diagram of Figure 1. The identification of nomadic adaptation options followed two-stage process. At first stage, prior to the application of FGI, the same set of options for focus groups is based on the findings and recommendations from literature review. At second stage, the FGI survey was carried out on five Mongolian graduate students from October to December in 2012. More-structured

interview formats are used to control the variations of conversation, so that the in-depth interviews could generally provide more detail about dynamic adaptation options in terms of nomadic lifestyle.

Disaster agents, adaptive capacity and applied area are respectively composed of rows of table. Each of the columns describes the options for nomadic adaptation, which also shows the degree of effectiveness to mitigate impacts of three primary disasters in Central Asia. For instance, improvement of grazing management can make a big contribution to the reduction of impacts caused by drought and dzud, while it may not be effective in preventing desertification. The development of water-efficient crops will be able to improve the resilience against drought and desertification, while it may not be relevant to dzud.

Table 1 Dynamic Climate Change Adaptation in the Nomadic Lifestyle

Nomadic Adaptation Options	Disaster Agents Triggered by Climate Change				Applied Area	
	Drought	Dzud	Desertification	Adaptive Capacity		
Conserving pastureland	• Improve grazing management system	H	H	M	M	Rural Area
	• Introduce cultivated pasture	H	H	M	M	
	• Planting heat/drought-resistant crops	H	H	H	L	
	• Legislate possession of pasture	M	M	H	M	
	• Use of water-efficient crops	H	M	H	L	
	• Conservation tillage	H	H	M	L	
Protecting livestock	• Improvement of shelter for animals	M	M	M	M	Rural Area
	• Supplementary feeding	H	H	H	M	
	• Animal breed choice	H	H	H	L	
	• Introducing high productive cross breeds	H	H	M	L	
	• Livestock control by the pasture capacity	H	H	H	L	
Developing water resources	• Use of marginal water	H	M	H	L	Urban/ Rural Area
	• Dams for water storage and flood control	H	H	H	L	
	• Introduction of new irrigation facilities	H	M	H	M	
	• Drip irrigation / Sprinkler irrigation	H	M	H	M	
	• Supplemental irrigation	H	M	M	L	
	• Watershed Management	H	H	M	L	
	• Improve Drainage systems	M	M	M	L	
	• Furrow and flat-bed irrigation	H	M	M	L	

Nomadic Adaptation Options	Disaster Agents Triggered by Climate Change				Applied Area	
	Drought	Dzud	Desertification	Adaptive Capacity		
Enhancing livelihoods	• Promote collective communities					Urban/ Rural Area
	• Enlarge the supply of renewable energy use to herders	M	H	H	M	
	• Set up insurance system for animals	H	M	M	L	
	• Establish natural disaster risk fund	H	H	M	L	
	• Develop community-based adaptation policy	H	H	M	L	
Improvement of awareness and institutional system	• Increase of awareness of herdsmen on climate change					Urban/ Rural Area
	• Assessment of impacts and vulnerabilities on climate change	H	H	H	L	
	• Set up legal instruments to assuring climate change adaptation	H	H	H	L	
		H	H	M	L	

Note: H-high, M-medium, L-low

The dynamics of nomadic adaptation against climate change threats would be ambivalent with the effects of implementation in the community. Generally speaking, nomadic lifestyle pattern may make it more difficult to adapt to climate change risk. It is all because the pastoralism has been keenly influenced by the drastic change of livestock products originated in climate change. Contrary to that, it would be noted that nomadic habit that do not stay in fixed settlement space and keep moving to seek better place will be able to help to enhance the ability to adapt to climate change threats. It is also in line with the contexts that the robust climate-adapted houses may be located in places where the climate is severe, for in extreme conditions there is no escaping the importance of dynamic adaptation (Anderson, 2009).

Regardless of seriousness of climate change impacts in Central Asia, preparedness of governments is not enough for dealing with climatic threats. Preparation for the nomadic adaptation is at an early stage and still requires considerable investment of time and efforts. The authorities of CA have a tendency to prefer low budget projects on climate change issues, leading to insufficient investment in necessary projects. In fact, government officials and citizens are commonly not aware of the

seriousness of climate change impacts and necessity of adopting nomadic adaptation based on nomadic culture. The institutional actions that handle dynamic adaptation of nomadic life are not ready and premature to make it. A significant first step to inaugurate nomad-based adaptation policies in the long term would be to start with providing incentives for conservation, improvement and investment in the nomadic resilience system in the rural community based on pastoralism.

V. Conclusion and Implications

This article has highlighted three main dimensions for the exploration of climate change dynamics in terms of nomadic lifestyle. The first tackles causing factors that is composed of disaster agents, which would be exacerbated by climate change. Dzug, drought and desertification are regarded as the key driving agents in Central Asia. The second refers to the vulnerability and is considered as affected factors that are mainly connected with pastoralism in rural area as well as urbanization in urban area. The third deals with nomadic lifestyle's adaptive capacity against climate change risks. The dynamics of nomadic lifestyle with three dimensions have been reviewed in the perspective of climate change adaptation. In this regard, it is argued previously that dynamic climate change adaptation should be taken into account in terms of nomadic life pattern, seeking to its implications.

It has been reviewed from the perspective of nomadism that the change of nomadic lifestyle would be caused by climate change, in need of the development of available adaptation policies against climatic threats in Central Asia. The dynamics between nomadic lifestyle and adaptation options are explored from the view of the resilience in nomadic community. The adaptation options and opportunities as well as the impacts of land use change and nomadic pastoralists' lifestyle caused by climate change cannot be overemphasized. This paper also emphasizes that nomadic lifestyle may aggravate the degree of vulnerability to climate change threats, whereas the potential of nomadic life to effectively adapting to the changed

environment can be superior to that of settler lifestyle in urban built environment.

Most of Central Asian countries are developing countries. A lot of attentions tend to be concentrated on the economic development issues. In many cases, global issues such as global warming or climate change may not be taken into serious consideration. If the authorities do not take any responsive actions against climate change without any delay, it will be too late to effectively cope with climate change. In fact, there are many uncertainties about the feasibility of the strategies and plans that aim at adapting to the changed environment.

Since the priority of national investment is concentrated primarily on its economic advancement rather than environmental degradation and climate change risk, there are still many uncertainties in the application of adaptation options and technologies in CA. Moreover, the immediate effects and visible benefits of any adaptation measures are hard to calculate and evaluate especially in the developing countries. It may require adoption of adaptation technologies with the large initial investments. Hence, it may cost much time and great efforts to construct an appropriate adaptation policy against climate change threats in Central Asia.

Dynamic adaptation discourse on climate change needs to be addressed with a comprehensive approach under the consideration of the historical uniqueness of nomadism and urbanization, while incorporating long term national development concepts. Planned adaptation against climate change threats is particularly important in developing countries, which need to entail policy making, fund-raising and incorporating tools for implementing dynamic adaptation options of nomadic lifestyle in the long term. It is required that institutional efforts of local or central government be made to reinforce the sustainability of the pastoralist livelihoods as well as to improve the resilience of the nomadic communities to adapt to environmentally dynamic change.

References

- Adger N., Lorenzoni I., and K. O'Brien. 2009. *Adapting to Climate Change: Thresholds, Values, Governance*. Cambridge University Press.
- American Water Works Association (AWWA). 2010. *Climate Change and Water: International Perspectives on Mitigation and Adaptation*. London: IWA Publishing.
- Anderson. 2009. *Homes for a Changing Climate*. Green Books.
- Anna, S. 2009. *Land Legislation and Pastoral Adaptation to Climate Change: The Example of Mongolia, Contribution to the conference Climate Change in Cold regions of Asia in April 2009 in Leh, Ladakh*. India.
- Assessment of Impacts and Adaptations to Climate Change (AIACC). 2006. *Climate Change Vulnerability and Adaptation in the Livestock Sector of Mongolia. Project No. AS 06*.
- Batima, P., Natsagdorj L., Gombluudev P. and B. Erdenetsetseg. 2005. *Observed Climate Change in Mongolia, the Third World Academy of Sciences, and the UN Environment Programme*. www.aiaccproject.org.
- Batjargal, Z. 1992. *The climatic and man-induced environmental factors of the degradation of ecosystem in Mongolia, International Workshop on Desertification*. Ulaanbaatar. Mongolia:19.
- Bloor, M. J., Frankland, M., K. Robson. 2001. *Focus Groups in Social Science*. Thousand Oaks. CA: Sage.
- Boldgiv, B. 2009. *Some Aspects of Climate Change and Human Development in Mongolia, Department of Ecology, Faculty of Biology. NUM*. Ulaanbaatar. Mongolia.
- Bolortsetseg, B. 2002. *Impact of recent past time climate change on rangeland productivity in Mongolia: Potential Impacts of Climate Change, Vulnerability and Adaptation Assessment for Grassland Ecosystem and Livestock Sector in Mongolia project*. AIACC. Ulaanbaatar
- Borgford-Parnell, Nathan. 2009. "Mongolia: A case for Economic Diversification in the Face of changing climate". *Sustainable Development Law & Policy*, 9(2): 54-56, 75-76
- Choi, C. 2012. "Inexorable rise of ger in Mongolia: demolition for redevelopment or conservation for improvement?". *International Review of Public Administration*, 16(2)
- Dagvadorj, D. and P. Batima. 2000. *Climate change and its impacts in Mongolia, AIACC Progress Report*. Ulaanbaatar.

- Erdenetseseg, B. 2002. *Annual report on snow cover in Mongolia: Potential Impacts of Climate Change, Vulnerability and Adaptation Assessment for Grassland Ecosystem and Livestock Sector in Mongolia project*. AIACC. Ulaanbaatar.
- ESCAP. 2010. *Protecting Development Gains: Reducing Disaster Vulnerability and Building Resilience in Asia and the Pacific*.
- Fay, M., Block, R. and E. Jane. 2010. *Adapting to Climate Change in Eastern Europe and Central Asia, The International Bank for Reconstruction and Development*. The World Bank: Washington DC.
- Giddens, A. 2009. *The Politics of Climate Change*. Polity Press.
- Gomboluudev, P. 2008. *Vulnerability of Rural People to Extreme Climate Events in Mongolia*. Institute of Meteorology and Hydrology, Mongolia.
- Government of Mongolia (GOM). 2003. *Potential Impacts of Climate Change and Vulnerability and Adaptation Assessment for Grassland Ecosystem and Livestock Sector in Mongolia*. Institute of Meteorology and Hydrology. Mongolia.
- IPCC. 2007. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment, Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.
- Leary, N., Adejuwon, J., Barros, V., Burton, I., Kulkarni, J. and R. Lasco. 2008. *Climate Change and Adaptation*. Earthscan.
- Ministry of Nature and the Environment of Tourism of Mongolia (MNETM). 2006. *Climate Change and Sustainable Livelihood of Rural People in Mongolia*.
- Mijiddorj, R. 2010. *Global Warming, Ecological Crisis in Mongolia, Ecology and Sustainable Development Center*. MUST.
- Stewart, D., Shamdasani, P., and D. Rook. 2007. *Focus Groups: Theory and Practice (2nd edition)*. Thousand Oaks, CA: Sage
- United Nations. 1994. *National Plan of Action to Combat Desertification in Mongolia (NAPCD)*. Ulaanbaatar: 266.
- Wisner, B., P. Blaikie, I. Davis, and T. Cannon. 2003. *At Risk: Natural Hazards, People's Vulnerability, and Disasters*. 2nd edition. London: Routledge.