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SOME POSSIBLE IMPACTS OF CLIMATE CHANGE ON HUMAN SECURITY IN THAILAND

Ulla-Maria Liisa Vesteri
Graduate Student, Graduate School of Peace Studies and Diplomacy, Siam University, Bangkok, Thailand
ullavesteri@hotmail.com

Tatree Nontasak
Associate Professor, Graduate School of Peace Studies and Diplomacy, Siam University, Bangkok, Thailand
tnontasak@gmail.com

Abstract

Climate change impacts such as sea-level rise, droughts and floods can pose a threat to human security in Thailand. This research is asking what kinds of challenges does climate change pose to Thailand and how will those challenges effect human security. Climate change is well researched topic but previous work has failed to address it through the lens of human security. This research wants to underline that climate change is not only an environmental problem, but can effect societies in larger scale. The methodology used in this research involved documentary research supplemented by three expert interviews. The findings of this research confirm that climate change impacts can effect human security of Thai population by destroying the crops, real estate and infrastructure. Therefore, it is recommended for Thailand to spread awareness of environmental issues, continue regional co-operation with ASEAN, and invest in research in

order to enhance mitigation and adaptation measures. Thailand should also prepare for climate related migration in the future.

Keywords

Climate Change, Human Security, Thailand

1. Introduction

Climate change is a global challenge and is already effecting the everyday lives of people around the world. Whereas the most prominent challenge in the Arctic region is melting ice and Africa and the Middle East suffer from desertification, the greatest issue for Asia is sea-level rise. This means that due to a range of factors, there will be less and less living space for both humans and animals. The reduction in space for farming, harsher conditions for both farming and living, together with the ever-growing global population creates a problem which will need a solution sooner rather than later. "Climate change will play an increasing role in causing – and exacerbating – humanitarian disasters, especially along coastlines" (Doig and Ware, 2016, p. 14).

The most prominent impacts of climate change in Southeast Asia, according to Lutvey et al. (2015), are typhoons, flash floods, landslides, droughts, rising sea levels, unpredictable water access, crop loss and large scale displacement of people. All of these events could pose a threat to human security. "Climate change is expected to have severe consequences on the lives and livelihoods of millions of people around the world, but its effects will not be evenly distributed" (Busby et al., 2014, p. 51).

The Southeast Asian region is especially vulnerable to the impacts of climate change for several reasons. Firstly, Southeast Asian economies rely heavily on agriculture and it is common that this sector may employ over fifty percent of the national workforce. In other words, climate change impacts such as droughts, floods and sea-level rise, threaten the livelihoods of almost half of the population of many Southeast Asian countries. Even though the livelihoods of half of the population might be at risk due to climate change impacts, the percentage of people who could be effected by impacts on food security may be much higher. Everyone needs access to food, and if the impacts of climate change cause challenges to food production, the whole population of some countries in Southeast Asia could be effected (World Bank, 2010).

Sea-level rise is one of the consequences of climate change, which will affect Southeast Asia. Rising sea levels will have three main effects. Firstly, the loss of arable land due to permanent floods. Secondly, rising seawater will also salinize (increase the salt content of) the soil and, finally, the sea water may leak into freshwater sources contaminating supplies of drinking and irrigation water (Forster et al., 2011). Along with the economy, food security might be in jeopardy if Southeast Asian countries cannot meet the required level of crop production due to weather anomalies, caused by climate change. As rice is an important export product of many Southeast Asian countries, a decline in production would also mean less income for the country's economy, not only at the individual level but also at the macro level. Geographical characteristics of Thailand also play a role in the vulnerability to climate change. "Water resources support more than 60 million people in the Lower Mekong Basin (LMB) and are important for food security—especially rice production—and economic security" (Trisurat et al. 2018: 73). Changes in the rainfall and extreme weather such as drought will affect the food security in Southeast Asia. "Greatest rice reduction was predicted for Thailand, followed by Lao PDR and Cambodia, and was stable for Vietnam" (Trisurat et al. 2018: 73).

Another crucial factor when it comes to climate change is availability of water. As mentioned earlier, sea-level rise might contaminate fresh water sources, as could floods. Droughts can also effect the availability of drinkable water as well as changes in rain patterns, especially in the parts of the country where communities rely on rain water (Lutvey et al., 2015).

Climate change is not only going to effect the global food supply, but also through sea-level rises, droughts and so forth, some parts of the world might become uninhabitable and this will force people to relocate. The International Organization for Migration (IOM) suggests that climate change will cause large scale forced migration. IOM estimate that the number of migrants moving due to climate change will range anywhere between 25 million and 1 billion people by the year 2050. Lutvey et al. (2015) argue that low income populations lack the resources for planned migration and are thus increasingly vulnerable to become the victims of human trafficking and modern day slavery. The Office of the High Commissioner for Human Rights (OHCHR) has stated that climate change will increase the number of human rights violations and the people who will suffer the most are those who are already in vulnerable positions either because of their geographical location, meaning mostly those from developing countries, or because of age or gender.

Nachmany et al. (2015) discuss several studies on the effects of climate change in Thailand specifically. According to the Grantham Research Institute on Climate Change and the Environment, Thailand has suffered from natural disasters and extreme weather phenomena during recent years. The 2004 tsunami and the heavy floods during 2011 – 2012 have helped to raise awareness about climate change. The National Economic and Social Development Plan (NESDP) have set targets and plan how to mitigate the impacts of climate change. In order to increase energy efficiency as well as to cut greenhouse gas emissions, NESDP has also developed a policy framework. Thailand has also created a National Committee on Climate Change (NCCC). Chaired by the Prime Minister, this legislative body was established in 2007. Even though climate change adaption is a key part of the Climate Change Master Plan 2014 - 2050, any concrete adaptation legislation has not been passed in Thailand yet.

2. Literature Review

Gemenne et al. (2014) argue that climate change, conflicts, famines, epidemics and migration are all covered by research as independent disciplines. However, if these incidences lead to human suffering then they, including climate change, should be researched through the lens of human security. The author also suggests that it might be challenging to prove the correlation between climate change and human security. Furthermore, even if there are already discussions about how weather-related events effect migration dynamics, "highlighting of the issues of human insecurity has not been matched by a sufficient engagement of the social sciences that have plausible and testable theories of how climate change can affect the security of populations" (Gemenne et al., 2014, p. 1). McMichael et al. (2006) are also arguing for a broader approach, including social, economic and demographic factors. When talking about the impacts of climate change, some authors argue that even violent conflicts might occur from the aftermath of global warming. For example Raleigh and Urdal (2007) argue that scarce water resources and arable land might lead to conflicts.

According to Salamanca and Nguyen (2016), Southeast Asia is highly vulnerable to the impacts of climate change due to the fact that most of these countries rely heavily on agriculture and furthermore, the level of agriculture in Gross National Product (GNP) is approximately 10%. Salamanca and Nguyen (2016) further state that poverty; low level of education and the carelessness of policy makers will also amplify the impacts of climate change in this region. The researchers make some recommendations based on the data they collected. In order to increase

climate change adaptation readiness Salamanca and Nguyen (2016) stress the importance of developing a regional agenda for farmers' adaptation as well as including farmers in the planning and decision-making process. The study also recommends "supporting sub-national networks and processes to advance adaptation, build public support for adaptation, facilitate sharing insights and experiences as well as strengthen funding for adaptation planning and action" (Salamanca and Nguyen, 2016, p. 1).

Doig and Ware (2016) argue that more than 1 billion people around the globe are living in coastal cities which are very vulnerable to climate change impacts. Many coastal cities are already suffering from recurrent floods, as well as extreme weather and aggressive storms. The report suggests that these climate change impacts will get even stronger and more severe due to the increasing population of the coastal cities. The study predicts that within several decades, the coastal population which will be effected by climate change impacts could rise by more than 50 percent. By 2060 Thailand's coastal population will be the 9th highest in the world. The coastal population in Thailand, which were exposed to climate change impacts in the year 2000 was 16.4 million and is anticipated to rise up to 36.8 million by the year 2060... Whereas Thailand as a country ranked 9th highest in the world for numbers of people living in coastal locations, Bangkok as a city ranks 7th, meaning that in 2010 907,000 people were exposed to coastal flooding, the anticipated number exposed in 2070 will be more than 5 million.

Marks (2011) notes how climate related events such as floods, droughts and sea-level rise as well as health related issues are already severe in Thailand and will get more serious in the future. The article argues that climate change will cause various challenges such as increasing the number of refugees and migrants. Furthermore climate change impacts could hinder the tourism industry and according to Marks, even cause class related tensions. The article also mentions the aspect of food security, "Major climate-induced changes could have severe negative impacts on Thai food production, particularly rice" (Marks, 2011, p. 230). Marks also anticipates that climate change related issues such as water management, refugee settlement as well as energy policies might cause friction between Thailand and its neighbors and therefore have an effect on the political stability in the region. When it comes to sea-level rise, Marks suggests that "saline intrusion from the sea has already contaminated some underground water sources" (2011, p. 233). This will have a severe impact on the soil productivity in the future. The article also discusses that sea-level rise can damage properties.

According to Lewis "Climate security is the study of the impact of climate and climate change on the security of effected communities." (2011, p. 11). Lewis notes how the definition of security in this case should be expanded. In other words, a softer definition of security should be included and not considering that conflict is the only threat to security. As Lewis (2011) later references Soroos "the assurance people have that they will continue to enjoy those things that are most important to their survival and well-being" (1997, p. 1). The article *Climate science in climate security scenarios* (Lewis, 2014) explains how the concept of climate security combines the comprehension of global weather systems and the dynamics of the socio-economic system in the particular region. Lewis also argues that "Nearly all the climate security scenarios identify the key threats of climate change as related to food security, water availability and weather related disasters" (2014, p. 18).

Barnett and Adger (2007) state that climate change is increasingly being recognized as a security problem, and further "climate change increasingly undermines human security in the present day, and will increasingly do so in the future, by reducing access to, and the quality of, natural resources that are important to sustain livelihoods" (Barnett and Adger, 2007, p. 639). The article also argues that climate change will make it more challenging for states to provide services as well as opportunities which would help people to sustain their livelihoods. Barnett and Adger (2007) even argue that climate change could lead to violent conflict. In terms of human security, the article suggests that climate change jeopardized human security by effecting people's well-being in a negative way.

Behnassi et al. (2013) underline how a well-functioning food system is one of the most important pillars of a stable economy. Behnassi et al. also argue that "addressing the challenge of global food security in our era is strongly linked with other global issues, most notably climate change" (2013, p. 4). The authors further list other drivers which are challenging food security as follows: global population growth, social drivers such as urbanization and economic drivers including trade and food markets. Behnassi et al. suggest that global food production should be increased by 70% within the next 35 years in order to feed the growing population. This will be challenging because climate change impacts such as droughts and floods will make farming conditions more difficult. Therefore, according to Behnassi et al. (2013) climate change poses a serious threat to food security, not only locally and regionally but even globally. Lobell and Burke (2010) explore how climate change can impact food security. Furthermore, the authors

argue that even if economic growth, which is reached through industries which cause carbon emissions, has made living standards better for many people around the world, not everyone has benefited from this growth. Still, today a vast majority of low income families live in the countryside and continue to rely on agriculture. "Given that agriculture everywhere remains dependent on weather, changes in climate have the potential to disproportionally effect these poor populations" (Lobell and Burke, 2010, p. 3).

3. Methodology

The purpose of this study is to explore the impacts that climate change is having on Thailand and their relationship to human security. The researchers used qualitative documentary methods, supplemented by interviews. Previous studies, as well as books, reports and journal articles are used as a secondary data. The secondary data also includes statistics which reflect climate change impacts. When it comes to interviews, three professors with expertise in environment as well as climate change were interviewed. The volume of information about climate change is immense and this research focuses mostly on academic resources. Peer reviewed academic journal articles, as well as books and publications produced by NGO's are used. In addition, this study uses newspaper articles which provide important information about public opinion relating to climate change. For the primary data, this research conducted three face to face interviews with experts on climate change or environment.

3.1 Objectives of the Research

In general, this research examines the relationship between climate change and human security. The specific objectives of this research are to find out what the challenges caused by the impacts of climate change are, and how those impacts will affect the level of human security in Thailand.

3.2 Research Questions

This research asks the following questions:

1. What kinds of challenges does climate change pose to Thailand?
2. How will those challenges effect human security?

3.3 Scope of the Research

This research concentrates only on studying the impacts of climate change on human security in Thailand. Thailand was selected because the country has a long coastline and is heavily dependent on agriculture. Studies suggest that Southeast Asia is one of the regions which

will suffer the most from the impacts of climate change (Lutvey et al., 2015). These are some of the factors which will make Thailand particularly vulnerable to climate change impacts. Furthermore, Thailand was selected also because there seems to be more research already conducted concerning South Asian countries such as India, Bangladesh and Sri Lanka than Southeast Asian countries such as Thailand.

3.4 Conceptual Framework

This research suggests that there is a negative correlation between climate change and human security. This means that when the impacts of climate change increase, the level of human security decreases and vice versa. For example when climate change causes sea levels to rise, there will be less and less land space for people and animals, hence the livelihoods of people are at stake and the level of human security decreases. Also, arable land could be decreasing through sea-level rise. In this study, the impacts of climate change is the independent variable, whereas human security is the dependent variable. The level of human security is dependent on the severity of the impacts of climate change. Furthermore, these two variables have negative correlation, meaning that they move in the opposite directions. If one increases, the other decreases and vice versa.

3.5 Data Collection

The volume of information about climate change is immense and this research focuses mostly on academic resources. Peer reviewed academic journal articles, as well as books and publications produced by NGO's are used. In addition, this study uses newspaper articles which provide important information about public opinion relating to climate change. For the primary data, this research conducted three face to face interviews with experts on climate change or environment. The interviewees were selected due to their vast experience on both lecturing and researching the environment and economical aspects of climate change and sustainability issues. Therefore, their answers rely on the researches made in the field, rather than just being a personal opinion. Another reason why these three interviewees were selected as a sample is due to their expertise on the environmental matters particularly in Southeast Asian region and in Thailand.

3.6 Data Processing and Analysis

This research processed the primary data collected first by writing down the recorded interviews to the form of transcripts. When having all the information on paper, the findings of personal interviews, and the information learned from the secondary data presented in the

literature review were compared. Especially similarities and differences of primary and secondary data were underlined.

3.7 Data Analysis Methods

Analysis methods for qualitative data differ from those used with quantitative data. Due the non-numerical nature of qualitative data, the methods of analyzing the findings of the research include content analysis of the secondary data as well as assessing the primary data, the face-to-face interviews of three key informants. The data analysis methods in this particular study include comparison of primary data, the interviews, and the secondary data, the literature review. The purpose of this study is to find a relationship between climate change impacts and the level of human security. The qualitative data can be analyzed at different levels of complexity and various methods of organizing the data can be used. So called data coding can be used to help analyses the large amount of data and in this research, few sub categories were selected. In order to make sense and most of all answer the research questions, the findings were divided to the following sub-categories and the data analyzed accordingly; sea-level rise, weather anomalies, agriculture, involuntary migration and adaptation and mitigation. Also, the recommendations were categorized into three sub-categories in order to enhance the clarity. The sub-categories are as follows; policy and strategy recommendations, management and practices recommendations and recommendations for future studies. The units of analyses of this study were the impacts of climate change, such as sea-level rise, droughts and floods. When conducting qualitative data analyses, the challenge is to stay objective rather than judging (Knight, P. T, 2002).

4. Findings

4.1 Sea-Level Rise as a Challenge in Thailand

As Thailand has such a long coastline, it is said that sea-level rise will be one of the most prominent challenges which climate change will cause to the country. Dr. Orapan Nabangchang (Personal Interview, 2016) stated "sea-level rise could be a problem and even one meter rise would effect Bangkok and also the economy due the losses of all the investment put in infrastructure". Another way sea-level rise can threaten human security, according to Foster et al. (2011), is the loss of arable land, meaning that some areas which earlier were used for agriculture, will be covered by water. Furthermore, rising sea water will salinate the soil and contaminate the fresh water resources if sea water leaks into the fresh water. The report by

ASEAN (2016) lists a few reasons why Southeast Asia is vulnerable to sea-level rise. According to the report, two factors which make Southeast Asia vulnerable to climate change impacts are the fact that economic activities as well as a large portion of the population are concentrated on the coastline. Therefore, not only the livelihoods of people might be in jeopardy but also people might need to relocate or at least change their way of living. As Thannasupsin (2012) states, one of the consequences of sea-level rise is inundation (land being permanently flooded by sea water) and the effect is regional. When it comes to sea-level rise, Marks suggests that "saline intrusion from the sea has already contaminated some underground water sources" (2011, p. 233). This will have a severe impact on soil productivity in the future. Dr. Nabangchang (Personal Interview, 2016) also discusses how changes in precipitation will affect the crops and furthermore, the loss of crops would also mean economic loss.

Sea-level rise can also have an impact on economic activities. Dr. Nabangchang (Personal Interview, 2016) mentions how rising sea level can effect popular tourist destinations in Thailand and via that, cause a large economic loss. Dr. Nabangchang (Personal Interview, 2016) mentions Koh Tao as one example: "this is one of the top ten diving sites in the world, if sea-level rises there, they will suffer from large scale economic loss". Also, Dr. Surendra (Personal Interview, 2016) suggests that climate change impacts can affect the economy. According to Dr. Surendra, in addition to actual damages, floods can also cause loss and damage to future productive power. Dr. Surendra estimates that economic losses caused by climate change will not only be suffered nationally but globally, when the whole supply chain is affected. Also, loss of infrastructure and the physical separation of people will have an impact on the economy, Dr. Surendra added.

According to Dr. Nabangchang (Personal Interview, 2016) the department of marine and coastal resources use modelling to study coastal erosion. They have some data about the coastline of Thailand, indicating which areas are high risk, medium risk and low risk regarding coastal erosion. With that information some preliminary calculations were made about how many communities would be effected. The department also has information about districts and sub-districts which have coastlines and if coastal erosion happens, what would be the effect to the value of the built-up areas around the coast and the livelihoods of the people. This is a major challenge. Also, statistics by Doig & Ware (2016) state that the coastal population in Thailand will double by the year 2060, meaning that almost 37 million people will be living in low-lying

coastal zones and will be exposed to the effects of sea-level rise. Doig & Ware (2016) also estimate that assets exposed to coastal flooding in Bangkok alone will increase from about US$ 39 million in the year 2010 to US$ 1,117.54 by 2070. These are very significant numbers and will therefore effect the economic security of Thai people.

Dr. Lawrence Surendra (Personal Interview, 2016) discussed that the sea level rises because the ice melts in the Himalayas and in the Arctic and therefore more water ends up in the ocean ecosystems. Another reason why sea level is rising is that the oceans expand as the temperature of the water rises (Climate Reality Project, 2015). According to Dr. Surendra, flooding can occur not only due to sea-level rise but also because of heavy rain. He underlines that even if the amount of rainfall would not differ, the changes in the rain patterns, mean that rain comes with great intensity within only a few days and can thus cause flooding. Dr. Surendra further mentioned (Personal Interview, 2016) how countries with long coastlines such as Bangladesh are going to lose a significant amount of land because of sea-level rise. Loss of arable land together with extremely high population density means that the country is facing the challenge of feeding more people with less land. Also, the World Bank report (2010) found that some areas might become uninhabitable due to sea-level rise or increases in air temperature. These kinds of changes in the environment might cause a mass movement of people which is already being seen in Bangladesh. The loss of arable land will most definitely pose a threat to food security through involuntary reduction of crop production. According to Dr. Bhaktikul (Personal Interview, 2017), Thailand has been preparing for the past ten years through research and activities relating to sea-level rise. Some studies have indicated that the sea level will rise gradually in the future. If information suggesting that Bangkok or Southern Thailand would be covered by sea water within the next few years were to be announced, it would cause panic in the society. Dr. Bhaktikul also stated that preparedness and awareness are important and further suggests that people could gradually move to the mountain areas and to the higher lands.

Sea-level rise could pose a threat to human security. Even if the most obvious component of human security in jeopardy is environmental security, rising sea levels could also have impact on other aspects of human security. As Dr. Nabangchang mentioned, sea-level rise could have severe impacts on the economy. Moreover, it could be said that sea-level rise threatens economic security. Dr. Surendra on the other hand, discussed that sea-level rise will have an effect not only on present productivity but also to the future productivity. When sea

levels rise, it can ruin the crops or it can destroy buildings and infrastructure. Moreover, it can even force people to relocate. All these factors will pose a threat to economic security when the livelihoods of people are at stake. When sea levels rise and when it destroys people's livelihoods or property, it can lead to unemployment and poverty, which the UNDP (1994) lists to be the main threats to economic security.

4.2 Weather Anomalies as a Challenge in Thailand

During a personal interview, Dr. Nabangchang (2016) discussed her concerns how climate change related weather anomalies such as floods and storms could be a challenge to Thailand in the shorter timeframe than sea-level rise. Dr. Nabangchang mentioned the major floods in Thailand which occurred in 2011 and effected almost all of the provinces throughout the country, and referenced a study which she took part in. That particular study was micro level research and found that the average economic loss on a household level was 100,000 Baht. "These kinds of floods are likely to occur more often in the current climate condition" Dr. Nabangchang argued (Personal Interview, 2016). According to Dr. Bhaktikul (Personal Interview, 2017) when it comes to drought and floods in Thailand, the big challenges are the frequency and the intensity. The events will be more frequent and more intense as well as more severe than before. However, Dr. Bhaktikul underlines that the situation in Thailand is not as bad as in some other countries. Maintaining mangrove forest as a natural front to block the worst storms is a good preparation measure.

According to Dr. Surendra (Personal Interview, 2016) weather anomalies will also effect the availability of drinkable water. In other words droughts as well as floods have a serious impact on ground water resources. All water depends on precipitation and if there is not enough rain, it means also that the ground water levels will be low. Moreover, floods have an impact on availability of drinkable water. Flooding contaminates the ground water and in the case of sea-level rise, there is a problem of salination. In addition to Dr. Surendra, Lutvey et al. (2015) argue that droughts and changes in weather patterns impact the availability of drinkable water, especially in the areas where people rely on rain for drinking water. Other scholars also agree about the challenges weather anomalies can bring with them.

Global warming, climate change and sea-level rise are expected to intensify the resource sustainability issue in many water-stressed regions of the world by reducing the annual supply of

renewable fresh water and promoting the intrusion of saline water into aquifers along sea coasts where 50% of the global population reside. (Baba et al, 2011, p. v)

Interestingly, other sources also argue that the availability of drinkable water will be a challenge; Dr. Bhaktikul (Personal Interview, 2017) stated that in the case of Thailand, this will not be a problem. He suggested that Thailand has plenty of water resources; hence the situation is very different from other dry countries such as Israel. Dr. Bhaktikul explained that when climate change related disasters such as floods occur, there could be a short period of time when availability of drinkable water might be in jeopardy, but after four or five days the situation would be under control because in Thailand, everyone helps each other.

According to a UNDP report (1994) natural disasters pose a threat to environmental security. In addition, floods for example, as Dr. Nabangchang mentioned earlier, can have large scale impacts on the economy. Therefore, weather anomalies such as droughts and floods can also threaten economic security. Furthermore, if droughts, for instance, ruin the crops it also can cause food insecurity. UNPD (1994) confirms that hunger and famine are the main consequences of a loss of food security, and climate related weather anomalies, which destroy the crops for example, can lead to that. The climate change related weather anomalies might have surprising economic impacts.

4.3 Agriculture at Stake

According to Dr. Surendra, first and foremost climate change is going to pose a challenge to agriculture. Due to the fact that Thailand is one of the biggest exporters of rice, the whole global food chain could be in jeopardy, not only food security in Thailand itself. Furthermore, if agriculture is effected, it also means that livestock feed will be effected and therefore the impacts will be on a larger scale, not only to the crops. Also, the World Bank study about regional risks of climate change in Asia argues that "…the large contribution of irrigated agriculture to food production and rural economies leaves this region highly vulnerable to predicted changes in the runoff of major rivers" (2010, p. 1). The same study also suggests that Southeast Asia is exceptionally vulnerable to climate change due the fact that its economies rely heavily on agriculture. It is common in this region that the agriculture sector employs over half of the population in respective countries (World Bank, 2010). In terms of food security, climate change threatens not only those working in the agriculture sector but all of the population in the countries. If droughts, floods or sea-level rise ruin the crops, the agriculture sector cannot supply

their products to the national, regional and global food chain. According to Dr. Bhaktikul (Personal Interview, 2017) some simulation models suggest that in Thailand, the production of rice could either decline or increase within the next 30 or 40 years. This is related to the fact that Thailand is a monsoon country and a one or two degree Celsius increase in the temperature might already mean the crops would decline. The situation is very different in cold countries, for example in Europe, where one or two degree rise in temperature could mean better crops. However, at times of climate related disasters such as floods or droughts, rice production will be effected in Thailand. Therefore, climate change related weather anomalies pose a threat to food security and this is also related to economic security. Thai farmers are already poor and according to Dr. Bhaktikul, disasters such as floods and droughts if ruining crops, also effect the livelihoods of the Thai farmers.

In addition to the findings of the World Bank and Dr. Surendra, Maplecroft (2015) argue that Thailand is one of the countries which will suffer the most from climate change impacts. According to the New Climate Change Vulnerability Index (CCVI), Thailand holds the ranking of 14th most vulnerable country to the effects of climate change, out of 170 countries which are included in this particular index. Another piece of research, conducted by Standard & Poor's (2014) suggests that Thailand, among other Southeast Asian countries, is vulnerable to climate change impacts due to its high dependency on agriculture and fishery as well as its long coast-lines which make it vulnerable to sea-level rise. Also, the ASEAN report (2016) expressed concern about the more frequent and severe droughts, heat waves, floods and tropical cyclones. The region is dependent on agriculture, forestry as well as natural resources. The regional organization is trying to mitigate the devastating consequences by creating co-operation and common policies.

Hollo et al. (2013) suggest that mitigation of greenhouse gases as well as energy policies have an important role in the field of environmental protection. In addition to mitigation policies Hollo et al. also argue that various adaptation measures are necessary in terms of water management, health policies as well as agriculture. Salamanca and Nguyen (2016), on the other hand, state that in ASEAN countries agriculture makes up approximately 10% of Gross National Product (GNP). Therefore, the impacts of climate change will also hit the economy through agriculture. The Intergovernmental Panel on Climate Change (IPCC) noted in their Fourth Assessment Report (2007) that climate change could undermine the living conditions of people

all over the world and at risk sectors include agriculture, forestry, water resources as well as energy systems, human health and economy (Scheffran & Battaglini, 2010). All in all, the data collected from both primary and secondary sources are in line with one another. The informants, as well as findings drawn from the previous studies, argue that climate change will have serious impacts on agriculture. Droughts and floods as well as sea-level rise will affect the crops and the productivity of land and further impact to the local, regional and global food chain as well as the economy. It can be concluded that climate change poses a threat to food security in Thailand. According to scholars Lobell & Burke (2010) due to the fact that agriculture is dependent on weather, the changes in climate will also effect the crops. When climate change threatens agriculture, food security is in jeopardy. Furthermore, economic security is at stake because the agriculture sector employs more than fifty percent of the Thai population. UNDP report (1994) categorizes unsafe food and malnutrition as examples of threats to health security. Dr. Bhaktikul (Personal Interview, 2017) discussed that climate change impacts not only pose threat to health security but also can cause death. He suggests that ten percent of the casualties happening during floods are caused by electric shocks.

4.4 Involuntary Migration Due to Climate Change

As mentioned earlier, climate change impacts such as sea-level rise, droughts and floods might make some areas uninhabitable. This could cause involuntary migration, meaning that people have to relocate from their homes even if their livelihoods rely on their current location. According to Dr. Surendra (Personal Interview, 2016) climate change played a role in the conflict in Syria. The country suffered from long droughts and people from the countryside lost their livelihoods and relocated to the cities. The cities did not have the capacity to cater all these people and that situation caused unrest and was a factor which accelerated the commencement of the conflict. In addition to Dr. Surendra, other scholars argue that climate change will cause an increasing number of refugees as well as migrants. Marks (2011) suggest that climate change related issues such as refugee settlement, water management and energy policies might cause friction between Thailand and its neighbouring countries. These aspects may contribute to the political instability of the region. People do not only relocate within their own countries, as Dr. Surendra (Personal Interview, 2016) discussed refugees from Syria and Africa has headed to Europe too. Gemenne et al. (2014) suggest that due to the fact that climate change is causing human suffering, it should be studied through the lens of human security.

The International Organization for Migration (IOM) has estimated that climate change could cause a large scale migration and the number of people who need to relocate in the future due to climate change impacts varies from 25 million to 1 billion by the year 2050. Due to the fact that people will need to migrate, their position will become more vulnerable and this will also see an increase in human rights violations such as human trafficking and modern day slavery, argues The Office of the High Commissioner for Human Rights (OHCHR). Faist and Schade (2013) also argue that some parts of the world will become challenging to live in because of climate change impacts, and this could cause major migration. In other words, Faist and Schade (2013) suggest that climate change will create a "push-factor" which they call "climate-push". Dr. Nabangchang (Personal Interview, 2016) argues that certain areas in North Eastern Thailand could become unproductive and therefore people would need to migrate. According to Dr. Nabangchang, forced migration is already happening due to the coastal erosion in Samut Sakhon for example. Some people will be more vulnerable, depending on their geographical location and economic means. "Climate change is expected to have severe consequences on the lives and livelihoods of millions of people around the world, but its effects will not be evenly distributed" (Busby et al., 2014, p. 51). Dr. Bhaktikul (Personal Interview, 2017) suggested that in Thailand, people will gradually move from the South and from the Bangkok area to the mountains and higher lands.

4.5 Adaptation and Mitigation

According to Dr. Bhaktikul (Personal Interview, 2017) adaptation to climate change impacts is very important. Even if the world could stop producing greenhouse gases now, it would take another 20 years to stop climate change. Of course it is not possible to stop producing greenhouse gases; therefore adaptation to climate change impacts such as floods and droughts is crucial. Dr Bhaktikul discussed that in Thailand, the research data from IPCCC working groups has been available already for twenty years and therefore at least academia is familiar with the impacts of climate change. However, the awareness of the public is not very high. This includes the NGO's and government sector. Dr. Bhaktikul pointed out that adaptation measures include new designs for regulations and also infrastructure. In addition to adaptation, Dr. Bhaktikul also underlined the importance of mitigation. These functions should be harmonized and executed in parallel to the adaptation measures. In other words, the current situation calls for practical

actions, not only theories. When it comes to mitigation plans, according to Dr. Bhaktikul, zero waste industrial plants, which turns waste into energy would be a good example.

Adaptation to climate change impacts covers both preparedness and readiness. According to Dr. Bhaktikul, these are the two weaknesses when it comes to temporary climate change related disasters such as floods. Furthermore, Thailand lacks a warning system, which would circulate the information from person to person about the upcoming storms and so forth. On the other hand, the strengths of Thailand are response and recovery. Meaning that when disasters, such as floods, occur people work together and help each other.

Another adaptation measure according to Dr. Bhaktikul (Personal Interview, 2017) is new infrastructure design. These designs could mean, for example, that the roads would have two functions in future. If they are built parallel to the rivers and channels, during the dry season they would function as roads and during the rainy season, they would function as drainage system leading excess water to the ocean. When talking about adaptation and mitigation, no nation can work by themselves, but cooperation at different levels is necessary. In the case of Thailand, regional cooperation within ASEAN states mostly includes training and capacity building. Cooperation with non-ASEAN countries mainly focuses on input data for modelling. Thailand has used research data from, for example, the United Kingdom, the United States, Japan, China, and the Netherlands. Also, local communities have a big role in the climate change adaptation (Dr. Bhaktikul, Personal Interview, 2017).

Dr. Bhaktikul underlines that the current challenge for adaptation in Thailand is the fact that different ministries are in charge of different functions. Therefore, it would be very important for them to work together. For example highways are designed by the ministry of transportation but drainage systems are planned by the ministry of agriculture. In order to follow the new design where roads would have two functions, the two ministries must be able to work together.

5. Conclusions and Recommendations

Climate change is a global problem and its impacts take various forms. Whereas the Himalayas and the Arctic are facing the challenge of melting snow and ice, the Middle East and parts of Africa suffer from desertification, Southeast Asia will need to adapt to sea-level rise, droughts and floods. This research has highlighted that climate change impacts could pose a threat to human security in Thailand. Climate related disasters such as floods, droughts and sea-

level rise are the most serious challenges that Thailand has to face in the era of global warming. According to the interviews this research conducted, as well as the data collected from secondary sources, agriculture is one of the sectors which will suffer the most from climate change. Droughts, floods and sea-level rise can ruin the crops or the soil making it challenging to grow crops. Thailand being a large rice exporter and agriculture employing more than half of the Thai population (World Bank, 2010), in addition to food security, climate change will also threaten economic security. According to UNDP (1994) unsafe food and malnutrition are examples of health insecurity. When climate change impacts threaten agriculture, health security could also be at risk.

Sea-level rise can affect economic security due the fact that Thailand has a long coastline and tourism is a very important part of the country's economy. Also, droughts and floods can pose a threat to the economy. Droughts can ruin the crops and people whose livelihoods depend on farming will suffer. Furthermore, larger scale droughts can also effect the macro level economy, because Thailand is a large rice exporter. Floods can have similar consequences of ruining crops but also damaging infrastructure and property. In addition to economic insecurity, climate change weather anomalies can also threaten food security. This research found that climate change impacts will also effect the availability of drinkable water; however, in the case of Thailand, the challenges will not be so serious because of the vast water resources of the country.

This research has also found that climate change can cause involuntary relocation of people. This study suggests that some parts of Thailand could become agriculturally unproductive and how the Central and Southern regions will suffer from sea-level rise, and river areas, from floods. The findings also pointed out that in other countries when some areas become uninhabitable and when people cannot support them in traditional ways, usually they move to the capital city or other big cities. However, in the case of Thailand, people might rather move to the mountain areas and higher lands.

The impacts of climate change, such as floods, droughts and sea-level rise could pose a challenge to human security in Thailand. Therefore, the following recommendations can be drawn from the findings of this research:

Policy and Strategy Recommendations

1. It would be recommended to spread awareness not only in the government and NGO sectors but also throughout the society. Whereas new designs and regulations are in order, also people can slow down the climate change impacts if awareness is spread. This means that environmental legislation and green innovations are important but also grassroots level actions can make a difference if people are educated to consume in a sustainable way.
2. As a member of ASEAN, Thailand should continue to develop regional cooperation and also engage in cooperation with other countries too.
3. Thailand could also invest in renewable energy sources, as one example; building zero waste industrial plants which would turn waste to energy.

Management and Practices Recommendations

4. Very important measures of adaptation and mitigation should be enforced. For example, Thailand could grow crops which are resilient to the future climate. Thailand could also take into account the flood and drought risk, as well as sea-level rise, when planning infrastructure development.
5. When it comes to adaptation, the warning system, which allows information to flow from person to person would be crucial to the survival of the communities which live in the disaster prone areas.
6. Cooperation between different ministries in order to design infrastructure is very important. A model of roads with a double function could be one solution to the flooding during the rainy season. Roads which would function as a drainage system to enable excess water to exit to the ocean could be a way to manage the flooding.
7. It would be reasonable for Thailand to also prepare for a climate change related mass movement of people.
8. The tourism sector should be prepared for climate change related challenges such as sea-level rise.

Recommendations for Future Studies

9. Climate change should be taken seriously and it would be recommended for Thailand to invest in climate change related research. This will raise the level of preparedness which is one of Thailand's weaknesses.

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