

Climate Change's Effects on Vietnam

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Abstract:

Vietnam faces daunting climate change threats. The country's future in the context of climate change has been likened to that of small island nations. This thesis does an initial survey of Vietnam's climate change threats, Vietnam's response to those threats, and how these threats might impact Vietnam in the future. Threats covered are reduced agricultural, fisheries, and livestock outputs and hazards to local populations. Vietnam's response is reviewed through relevant policy while making an attempt to view physical action through studies and current events. This view of the Vietnamese response is then used to explore future threats Vietnam might face through the lenses of food security, human migration, and internal and external conflict.

Introduction: The Problem

The Socialist Republic of Vietnam is often predicted to be one of the most negatively impacted countries in the world by climate change (Thayer, 2011; U.S. Forestry Service, 2011). Eighty-three percent of Vietnam's population lives within one-hundred kilometers of the 3,444-kilometer-long coastline. Vietnam has the thirteenth largest population in the world (Hinrichsen, 2011), and by the year 2025 population is expected to exceed 102 million people (Thayer, 2011). Large numbers of Vietnam's population depend on the agriculture, aquaculture, and freshwater sources that are threatened by climate change (Thayer, 2011). Sea level rise threatens large areas of Vietnam, endangering food production and local populations. In addition, these regions are important economically. A report on coastal zone management in Vietnam noted that coastal regions make up over 80% of Vietnam's gross domestic product (Hua et al., 2011, p. 2). According to Dr. Carlyle A. Thayer, an expert on Vietnam and South East Asia, "Vietnam is slated to become one of the countries most adversely affected by global climate change, comparable to Bangladesh and small island states" (Thayer, 2011, p. 31). Thayer and others claim that the coastal nation of Vietnam will endure a similar fate to small island nations, except on a massive scale. (Hua et al. ,2011; Thayer, 2010) Large portions of Vietnam's population will be impacted by climate change.

This thesis seeks to find climate change's effects on Vietnam because it is important to observe out how Vietnam plans to address these risks, as policy experts need to understand the challenges that may arise while addressing these risks. Specifically, this thesis will answer the questions: How is Vietnam addressing climate change? What challenges might Vietnam face while combating climate change? What future problems may arise from climate change?

To answer these questions, we must first identify the direct impacts of climate change. This is difficult. The situation in Vietnam is under-researched, quickly developing, and the

problems are deeply interrelated. The book *Coastal Disasters and Climate Change in Vietnam* notes that, “In fact, the factors leading to coastal vulnerability are quite complicated, as illustrated in Figure 7.1” (Thao, Takagi, & Esteban, 2014, p. 158).

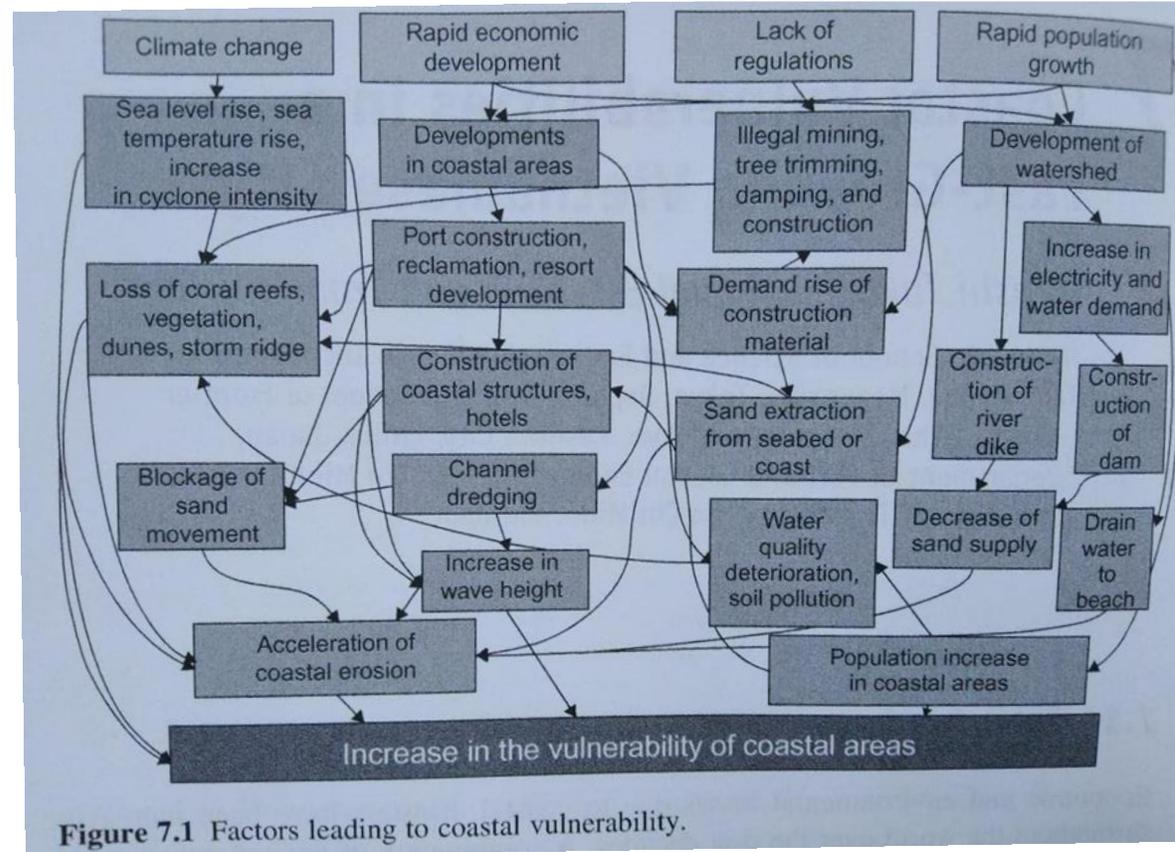


Figure 7.1 Factors leading to coastal vulnerability.

This figure is important because it captures the depth and magnitude of the challenges in addressing factors related to climate change and the vulnerability of the coasts in Vietnam. In addition to climate change, under-regulated industry, population stresses, and development are combined producing an all-out assault on the Vietnamese coastal zone. This paper will attempt to focus only on the effects of climate change that are likely to lead to future challenges for the government and people of the Socialist Republic of Vietnam. To create a holistic view of what Vietnam’s future challenges may be, and because these issues are extremely interrelated as noted in the figure, this paper will also bring light to many non-climate change environmental issues.

This thesis does not attempt to claim that all challenges within are climate caused, only that they may be worsened by climate change or be relevant to future threats. Vietnam's response to these threats will be examined by exploring agencies tasked with responding to climate change, looking at how integrated coastal zone management (ICZM) has progressed and seeking ways in which the response to climate change has been effective and ineffective. While limited, there is information available on the national level of these Vietnamese agencies. However, each province is responsible for its own ICZM plan. While there is adequate information on the national level, limited information is publicly available for the inter-workings of provincial governments, including ICZM plans. However, there have been studies and pilot programs run by foreign governments and non-governmental organizations that give a view of what the Vietnamese response could look like. Therefore, this paper will seek to find not only evidence of what Vietnam had done to combat these climate-related threats, but also ways in which Vietnam could be responding to climate change either currently or in the future. Finally, this thesis will analyze what Vietnam might look like in the future, and in particular, what challenges could arise from the combined un-mitigated effects of climate change and related issues.

Impacts of agricultural development.

In the years after reunification, the Socialist Republic of Vietnam developed a Soviet-style economy. The new regime placed a renewed focus on agricultural developments and began development projects to turn the countryside, entwined with rivers, floodplains, and deltas, into arable cropland and in later the 1990s, hydroelectricity. This had a dramatic effect as Dr. Bui Ba Bong explains in *Bridging the Rice Gap in Vietnam*, Vietnam had over 7 million hectares of agricultural land, producing over 30 million tons of rice. Most of this production has long been concentrated in the Mekong and Red River regions, but to increase yield, agricultural methods changed dramatically in these areas since 1983. Dr. Bui explains it in depth here, "In the past,

Vietnam had 300,000 ha of the floating rice in the Mekong River Delta (water level is as deep as 3 m at flowering time). But since 1983, these areas were converted to irrigated areas with 2-3 rice crops per year when the new canals were constructed. In the Mekong Delta at present there are some 600,000 ha of medium-deep-water with floodwater depths of 30-100 cm. Most of the rice is rainfed and is unlikely to be replaced by irrigated rice because of the limitation of freshwater resources. Traditional varieties are grown which are photoperiod sensitive, with a yield range from 2.5 to 4.5 t/ha” (Bui, 2000, p. 158). This land use change was incentivized by the fact that these floating rice paddies only produce about two-and-half to four-and-a-half tons-per-hectare while irrigated systems, having two or more seasons, generate the same two-and-half to four-and-a-half tons-per-hectare during the wet season and an additional six to seven tons-per-hectare during the dry season. The result was large sections of the Mekong and Red River deltas being converted to flood based agricultural land using dams, levees, wells, and river fed canal irrigation systems operated by local flood districts. Since then Vietnam has become the second largest producer of rice for export (Thayer, 2011). However, this influx in agriculture in the low lying deltas that helped develop the country, would soon prove to be at severe risk due to sea level rise, saltwater intrusion, typhoons, and other climate-related threats.

How Will Climate Change Affect Vietnam?

To understand how Vietnam is responding to climate change, it is important to first look at climate change's effects on Vietnam. A vulnerability assessment done by Vietnam's Ministry of Natural Resources and Environment (MONRE) concluded that by the end of the century temperatures will increase an average of 2.3 degrees Centigrade with a range of around 1.6 to 2.8 degrees Celsius across the country (Ministry of Natural Resources and Environment, 2009). Overall, temperature will have little direct impact on Vietnam. Sea levels are expected to rise significantly. Moderate estimates put the rise at about seventy-five centimeters by the year 2100

(Ministry of Natural Resources and Environment, 2009). This will impact agriculture, coastal populations, and the Vietnamese economy.

Some scientists believe that the frequency and severity of storms are increasing around the world. Vietnam is no exception, as noted in *Climate Change in Vietnam: Assessment of Issues and Options for USAID Funding* by the United States Forestry Service, "The frequency and severity of typhoons and other severe storms has increased and is likely to increase further, with associated storm surges, saltwater intrusion, flooding, landslides and damage to coastal infrastructure" (United States Forestry Service, 2011, p. 10). Climate change is expected to affect Vietnam in profound ways. The greatest threats from climate change are reduced agricultural productivity, fishery resource degradation, and sea level rise.

Reduced Agricultural Productivity

It is impossible to cover every aspect that that climate change will impact reduced agricultural productivity in the scope of this paper, so this section will focus on a few of the areas thought to pose the greatest threat to productivity: saltwater intrusion, increased storm severity, and landslides.

Saltwater intrusion.

As sea levels rise, tides and seawater venture further upstream in rivers around the world. The distance the tidal flow will venture inland is determined by the river's rate of flow versus the strength of the tide. With rising sea levels, there is more pressure pushing back against the river's flow, causing more seawater to enter the delta with the tides. Salinity increases in Vietnam's rivers and deltas is important because, via irrigation canals, they are the water sources for agriculture throughout large sections the country (Thao, Takagi, & Esteban, 2014). Saltwater intrusion is widely known to cause a reduction in crop productivity and soil degradation (Provin & Pitt, 2001). Because salt degrades soil quality, there is consensus that saltwater intrusion will

reduce crop outputs significantly in Vietnam, as noted in the U.S. Forestry Department report, *Climate Change in Vietnam: Assessment of Issues and Options for USAID Funding* (2011).

Saltwater intrusion has been worsening and will likely continue to increase because of upstream hydroelectric dams that reduce flow rates (Ministry of Natural Resources and Environment, 2009; Thayer, 2011).

Increased storm severity.

As noted above, in the US Forestry Service report claims, climate change is associated with an increase in frequency of large storms (2011). It is important to note that while this claim has been widely used by Vietnam's Ministry of Natural Resources and Environment (MONRE), Vietnamese news, USAID, and others, it has not been widely accepted by the scientific community as noted in Coastal Disasters and Climate Change in Vietnam, "According to MONRE, a number of Vietnamese reports have highlighted growing concerns over the threat posed by typhoons in the context of climate change. However, MONRE's reports do not show clear scientific evidence to corroborate this tendency, despite the fact that their analysis is likely to have great influence on climate change policy in Vietnam. (2014, p. 4)" MONRE and others who plan infrastructure and disaster mitigation in Vietnam seem to have little interest in debating the likelihood of the increased frequency. This is likely because it is not disputed that there will be an increase in severity of these storms, only the frequency. The book continues, "In recent years, a number of researchers have even voiced concerns about the possibility that global warming may have already been causing an increase in tropical cyclone intensity, and it is claimed that a 30-year analysis of satellite records of tropical cyclones provides evidence for this. (p.4)" Because the severity will increase, even if the frequency decreases, there will be a greater impact. This becomes even more apparent when we include sea level rise and its associated effects. Along with these storms come storm surges, increased saltwater intrusion,

flooding and destruction of infrastructure in coastal areas, and debris flows in the higher elevations (United States Forestry Service, 2011).

Landslides.

Flooding, debris-flows and landslides are already a regular problem across Vietnam. In 2017, one of the worst typhoon seasons in recent history, there were four named storms and two typhoons. The largest, a category two storm, was the worst on record since 2001, triggering widespread landslides and flooding (“Dozens killed in Vietnam flash floods,” 2017; Nguyen, 2017a). Because landslides are triggered by heavy rain, there is correlation between large storms and landslides.

One of the hardest hit places during the 2017 rain events was Hao Bing Province. A study five years before, in 2012, noted that despite the fact that landslides are largely predictable in the province, “few attempts have been made to forecast their location or prevent their damage. Previously only a few investigations of landslide susceptibility analysis have been carried out in Vietnam” (Tien Bui, Pradhan, Lofman, Revhaug, & Dick, 2012). Landslides like the ones in 2017 can be avoided or reduced in effect by proper planning and land use. However, the brunt of these disasters is often borne by the least fortunate and often under-educated, who have limited resources or ability for proper planning. These poor farming communities in the countryside are often the most affected as they can lose their crops, homes, and sometimes even the land.

Fisheries Degradation

Over thirty-five percent of the Vietnamese dietary protein intake comes from fisheries, thus the stability of these fish stocks is closely related to food security (Thayer, 2011). Notably, according to Captain Adam Greer of the United States Air Force, twelve percent of the global fish catch happens in the South China Sea. He goes on to explain that, “As of 2008, virtually all SCS fishery stocks are collapsed (roughly 25 percent), over-exploited (roughly 25 percent), or

fully-exploited (roughly 50 percent)” (Greer 2016). That was now more than ten years ago. The situation had only worsened by 2016, Captain Greer notes.

Fisheries stocks in the region are threatened by climate change, habitat loss, and illegal, unreported and unregulated (I.U.U.) fishing which are exacerbated by regional territorial conflict and the lack of fisheries management cooperation (Zhang, 2018). Climate change has affected fisheries with increased water temperatures and increased pH levels, called ocean acidification (Hinrichsen, 2011). Ocean acidification can make it difficult for calcium producing animals, such as those that produce shells or coral, to grow. This not only reduces habitat for fish through coral reduction, it affects the food web by a reduction in zooplankton and other animals that tend to be in the base of the ocean food webs (Hinrichsen, 2011).

Territory disputes in the South China Sea have led to the further destruction of fish habitat. China, Vietnam, and others have turned formally submerged reefs into military installations through dredging the surrounding areas and piling the material on the reef. This kills fish, reduces habitat, and further militarizes the region. While it is clear that the militarization of the region is having an impact on fish stocks and habitat, Captain Greer brings up an important point. Could fisheries be a substantial cause of the dispute? “China’s regional interests can be roughly lumped into three “P”s—politics, petroleum, and proteins (fish). The last of these interests, competition over dwindling SCS fisheries, may be most consequential in driving competition, but has not received sufficient analytic attention” (Greer, 2016). Greer believes that food security and fisheries competition could be driving the dispute faster through habitat loss and overfishing. This seems to make perfect sense when we look at it through the lens of the tragedy of the commons, “when a good is provided to a population, an incentive arises to consume the good without providing for its maintenance” (Wade, 2015). The good, fisheries, is

being consumed without nations providing maintenance in the form of a sustainability plan or marine protected areas.

IUU fishing.

The name makes it is easy to tell why little is known about the scale of world illegal, unreported and unregulated (IUU) fishing. The South China Sea is no exception, but some estimates put the IUU catch near the reported catch of ten to twelve million tons annually (Greer, 2016). While it is not directly related to climate change, it is important to talk about IUU fishing because it helps build a holistic view of fisheries threats in Vietnam, the South China Sea, and the region as a whole. IUU fishing is extremely damaging to the economy and environment of the nation's waters that are being fished. Because of territorial disputes, what is illegal to fish under one country's laws may be completely legal to fish under the laws of others.

The difficulties in managing fisheries are highlighted by the 2011 season where Chinese conservation-based tuna fishing restrictions resulted in Chinese vessels declaring only 300 tons while Vietnamese vessels declared 110,000 tons of tuna from the South China Sea (Greer, 2016). Vietnam does not recognize the claims of China, and there was not an agreement for fisheries cooperation at that time. Thus, the Vietnamese fishermen were able to fish some of the best tuna grounds in the South China Sea without Chinese competition.

Coastal habitat loss.

A contributing factor to fisheries resource degradation, salt-water intrusion, erosion, and flooding of coastal populations is the loss of coastal habitat. As Vietnam develops, cities, aquaculture, and agriculture projects grow as well, encroaching on the natural environment. In the coastal zone, this means the destruction of mangrove forests and coastal seagrasses that serve as the first line of defense against typhoons and other weather events. Coastal development, largely shrimp ponds, "... has led to the loss of seventy to eighty percent of Vietnamese and

Philippine mangrove forests...” (Hinrichsen, 2011, p. 68) This is important because these coastal habitats often serve as the first line of defense against natural disasters like typhoons.

Hazards to Coastal Populations

Storm surge.

Storm surges occur when large and therefore very low-pressure systems, such as tropical storms or typhoons, draw large amounts of seawater toward the storm. In addition to this, winds push the seawater, building it up against the shoreline (Hinrichsen, 2011). The result is similar to a very high tide that can inundate coastal areas causing salt-water intrusion, flooding, erosion, and destruction of infrastructure. Because Vietnam has a long coastline and large populations have moved into the vulnerable deltas and coastal cities, storm surges pose a significant threat to a large portion of Vietnam's population, agriculture, and aquaculture.

Subsidence.

Flooding due to sea level rise is expected to continue to be a major problem, especially in urban areas such as Ho Chi Minh City where land subsidence along with rising sea levels have resulted in regular flooding during ‘king’ tide events (Vachaud et al., 2018). Land subsidence occurs when the sponge-like soil structure of the deltas start to dry out. This is caused by a lack of seasonal flooding, overuse of wells, and increased development. Before the rivers were tamed by levees, the delta flooded regularly. With this flooding came a saturation and deposition of soils that kept the deltas moisture content high and the ‘sponge’ full. Since the construction of levees and the turn to large-scale agriculture projects, the delta has increasingly relied on well-water for agriculture needs. In addition to this, according to a publication in the Journal of Hydrology, "Subsidence [in Ho Chi Minh City] is the result of intensive groundwater pumping to secure building basements and is also linked to the construction of a new underground metro system due for completion in 2019" (Vachaud et al., 2018). The ‘sponge’ of the Mekong Delta is

being drained, dried out, and compressed by human stresses. This sinking of the delta will cause it to flood even faster when combined with the effects of sea level rise, erosion, and increased storm severity.

Projections

The threats against the agriculture and fisheries of Vietnam are widespread. Storms and sea-level-rise bring saltwater intrusion, flooding, landslides, and therefore reductions in agricultural output. Due to these factors, some conservative estimates put the reduction of Vietnamese crop productivity as high as twenty percent (Misdorp, 2011). This significant because The World Bank estimated that, "In 2006 agriculture, forestry, and fisheries accounted for 20 percent of Vietnam's GDP, 54 percent of its employment, and 30 percent of its exports" (World Bank, 2011, p. 1). Fifty-four percent is a very high number of the population employed for only twenty percent of the gross domestic product (GDP). This is important because the productivity of the rice crop in Vietnam is linked to the food and economic security of not only Vietnamese but other countries that depend on Vietnamese grain exports (Thayer, 2011).

Coastal populations in Vietnam are some of the most at risk of flood in the world, as pointed out by a study conducted by the Organization for Economic Cooperation and Development on port cities. The 131 cities were judged on," the exposure of people, property, and infrastructure to a mean sea-level rise of 0.5 meters by 2070, a hypothesis that is by no means extreme." The results of the study were striking for Vietnam as Dr. Thayer continues to explain, "Vietnam ranked fifth in terms of exposed population. When the risk of exposure was projected out to 2070, Ho Chi Minh City still occupied fifth position, but the northern port of Hai Phong rose to tenth position" (Thayer, 2011, p.30.). Hai Phong and Ho Chi Minh Cities are large economic centers with vital ports and large populations. The fact that two of the largest cities in

Vietnam are expected to of the most impacted in the world is compelling, and it begs the question: What is Vietnam doing to address climate change related risks?

How is Vietnam addressing climate change?

Climate change has created unique challenges for Vietnam. The country has responded by creating a legal structure to deal with climate threats across multiple agencies and levels of government, engaging the international community for guidance, and completing a vulnerability assessment, a series of integrated coast zone management (ICZM) pilot projects, and Vietnam's *National Strategy for Climate Change*. There is a lack of English language information on the actions of individual province or district coastal defense projects or ICZM plans. However, information is widely available on best practices of coastal management and Vietnam's active engagement with the international community on climate change. This thesis will focus on management techniques employed by Vietnam, the three ICZM pilot projects in the Vietnam-Netherlands Integrated Coastal Zone Management Program, the Vietnamese *National Climate Change Strategy*, and efforts to manage fisheries resources.

There have been numerous studies on the potential and looming impacts of climate change, but there is very little English source information of on-the-ground actions in Vietnam to mitigate these risks. The following sections are not intended to be a comprehensive display of Vietnam's response, rather it is an attempt to display the Vietnamese government's physical, organizational, and social response to climate change across multiple agencies and levels of government.

Vulnerability Assessment

Vietnam first engaged the international community on its climate-related threats in 1993 when Nguyen Ngoc Huan presented a preliminary vulnerability assessment using standards set by the Intergovernmental Panel on Climate Change (Hua et al., 2011). This was followed by the

Vietnamese Coastal Zone Vulnerability Assessment, completed in eighteen months between 1994 and 1996 (Hua et al., 2011; Kelly, 2015). This assessment allowed for the first collaboration between Vietnamese, Dutch, and Polish experts in the form of workshops and training in Hanoi and the coastal provinces. The vulnerability assessment identified many of the threats noted in the previous sections such as the annual flooding of up to 17 million people, coastal wetland loss, rice production decrease, and the need for flood protection (Hua et al., 2011).

Integrated Coastal Zone Management

The next phase of Vietnam's action was the Vietnam- Netherlands Integrated Coastal Zone Management Program (VNICZM) (Kelly, 2015) This program consisted of a series of pilot projects completed between 2000 and 2006 across Vietnam. The goal of these projects was to develop ICZM plans for critical provinces to act as an example and to build capacity for further action. They were conducted in three coastal provinces, Nam Dinh, Thua Thien Hue, Ba Ria Vung Tau and in the capital, Hanoi, under the guidance of the Vietnamese Ministry of Natural Resources and Environment (MONRE) (Hua et al., 2011; Kelly, 2015). These ICZM programs were “simultaneously carried out in Hanoi and the coastal provinces in a manner consistent with Vietnam's constructive, holistic, and gradual approach to decentralization (Kelly, 2015, p. 212).” The Vietnamese approach is to allow provincial governments to spearhead the coastal projects in their community, with the support of ministries in Hanoi (Kelly, 2015). This approach gives the provincial government the ability to focus directly on issues they find most threatening to their community.

This governance style, often referred to as shared governance, community-based management, or co-management, is significant not only because it shows the Vietnamese government's commitment to decentralizing power, but more so because this devolution of power allows for a “two-track approach” and “the sharing of responsibility” (Jones, Gray,

Macintosh & Stead, 2016, p. 32). This approach has been described as “the best response to implementing conservation policy because it enables capacity building to take place at both the local and national levels, so each can assume appropriate levels of responsibility (Jones, Gray, Macintosh & Stead, p. 31).” This is important because the local government and stakeholders are often more aware and invested in local issues, it builds capacity at the local level, and because it allows the ministerial level to focus on the overall implementation and enforcement of coastal policy set forth by the Vietnamese National Assembly.

Nam Dinh Province ICZM.

The Nam Dinh Province integrated coastal zone management (ICZM) plan was one of the initial pilot coastal management projects in Vietnam. Nam Dinh province is located in the lowlands of the Red River Delta, in the north of the country. These lowlands are highly susceptible to physical threats sea level rise, storm surge, and other climate threats. This area has been described by Vietnamese researchers as “the most dynamic part of the coastal zone (Kelly, 2015, p. 213).” Nam Dinh’s physical climate-related threats can be broken into two categories, short and long term. The short-term threats include tropical cyclones (Kelly, 2015) and flooding (Hua et al., 2011) while long-term threats include coastal erosion and sea level rise (Kelly, 2015; Cong, Cu, & Shibayama, 2014).

Inhibitors to successful coastal management before the ICZM period in Nam Dinh were found to be largely a lack of local stakeholder education, buy-in, and involvement on coastal issues (Kelly, 2015). Social threats to the climate change response in Nam Dinh were cited as “low awareness of the value of coastal resources, lack of understanding of common resources and the need to safeguard values, difficult living conditions and population growth, and the tendency to exploit resources for immediate benefits (Kelly, 2015, p. 212).” This meant that

education and improved socio-economic conditions of the local population should be an important part of any ICZM plan in Nam Dinh and other rural provinces in Vietnam.

The Nam Dinh Province ICZM was the first to be implemented in the post Vulnerability Assessment period in Vietnam. The Dutch brought valuable expertise to train their Vietnamese counterparts in effective shared governance and coastal protection (Hua et al., 2011). According to Kelly, “The resulting ICZM strategy for Nam Dinh Province consisted of six components (Kelly, 2015, p. 213)” Of the six, the first two were education and mobilization related: “Public awareness and education on natural resources, environment, and sustainable development” and “Training, mobilizing human resources for ICZM (Kelly, 2015, p. 213).” Number three was the protection aspect of the strategy, “Protection and conservation of coastal natural resources and values.” Numbers four and five show where the Vietnamese plan to emphasize their physical response in Nam Dinh: “Prevention and minimization of natural hazards” and “Rehabilitation and improvement of habitats and polluted and degraded objects/environmental components.” The last point, number six, was a goal to change the values of the local population, “Development of coastal potentials and values (Kelly, 2015, p. 213).” The last point could be summed as the hopeful outcome of the previous points. When all the other points have been adequately addressed, education, prevention, and physical action, then the outcome should be newly instilled coastal values that will further protect the coastal zone in Nam Dinh Province.

Thau Thien Hue ICZM.

In contrast to the lack of stakeholder involvement and education in Nam Dinh, the Thau Thien Hue ICZM pilot project was created by stakeholders and approved by the provincial government (Hua et al., 2011). According to Hua, “The People’s Committee of Thau Thien Hue Province chaired the process of dialogue, which uniquely brought together Departments local consultants and stakeholders in detailed discussions of problems issues, strategies for the future

and potential action plans for solutions (Hua et al., 2011, p. 10).” This style of co-management was referred to as “unique” because it is not common in Vietnam. The socialist style of government meant that, in the past, most issues were centrally controlled or controlled by the local People’s Committee with little input from non-party stakeholders. In fact, involvement and education of local stakeholders and populations were cited as one of the most successful aspects of the Thau Thien Huen ICZM program (Hua et al.).

Challenges to coastal cooperation in Thua Thien Hue Province during the period prior to the ICZM period were cited as population and economically driven resource consumption, degradation, and depletion. Prior to the ICZM period in Thau Thien Hue, it was noted that there were “several areas of conflict between uses and there [was] a strong need for an improved management system to support decision-making balancing the different competing interests... (Tran, Bucx, & Misdorp, 2011, p. 2).” The ICZM seemed to have alleviated some of these conflict problems as it brought stakeholders together in community-based management.

Remote Sensing and GIS capacity building in Thau Thien Hue.

Much of the information on the work done in Thau Thien Hue was on the building of technical capacity in of Vietnamese counterparts. This program focused on building capacity in Geographic Information Systems (GIS) and Remote Sensing (RS) (Tran, Bucx, & Misdorp, 2011). The goal was to better understand and monitor what was happening in the quickly developing situation on the ground. Training once again took place in the Province and the Capitol to ensure technical competence across multiple agencies and levels of government. On the provincial level, there were two intensive RS training courses that generated valuable results and findings. According to *Remote Sensing Applications in Thua Thien Hue Province*, the findings included, “A new estimate for soil erosion for the Thua Thien Hue river basins,” “the [realization of a] strong expansion of aquaculture areas,” “Shoreline changes along the Thau

Thien Hue coast and outlets important to defining guidelines for building and spatial planning,” and a clear “flood sensitivity analysis (Tran, Bucx, & Misdorp, 2011, p. 10).” This progress allowed for the group to complete the first analysis of the “carrying capacity,” or how much stress an ecosystem can take, of one of the most important features in the area, the Tam Giang-Cau Hai lagoon system (Tran, Bucx, & Misdorp, 2011). This cooperation strengthened ICZM projects in Thau Thien Hue and across Vietnam by showcasing how workshops can help educate local leaders.

Ba Ria Vung Tau Province ICZM efforts.

Although little information is available on Vung Tau Province’s resulting ICZM plans, it is important to look at this case because of the uniqueness of competing interests compared to the rural provinces. Vung Tau is only two hours by car from District One, Ho Chi Minh City. It is a bustling city, especially when compared to the coastal rice paddies of Nam Dinh. Tourists and locals looking for relaxation flock to Vung Tau’s beaches. The stress from tourism and industry was felt during the ICZM process here. According to the Hua, key problems in Ba Ria Vung Tau were found to be “conflicting pressures of tourism, nature (mangroves), industrial developments, and coastal erosion” (Hua et al., 2011, p. 11). Although the only one of these problems that are unique to Vung Tau is the high level of tourism, one could argue that higher population density also could have hindered successful ICZM planning due to a greater number of competing interests.

In the past tourism was seen as an opportunity to draw attention from stakeholders during the ICZM process. In Nam Dinh for example, developing Xuan Thuy National Park sustainably was regarded as a serious issue (Kelly, 2015). However, in Vung Tau, it seems that tourism may be conflicting with conservation issues (Hua et al., 2011). Although the authors don’t say this directly, it is easy to deduct this while provinces like Nam Dinh progressed through the ICZM

process quickly towards creation of a master plan, in contrast in the Province of Ba Ria Vung Tau, Hua says, “A Guideline for ICZM Strategy and Action Planning was well received (Hua et al., p.11, 2011).” The verbiage here is clear. They only received the guidelines. This means that they were unable to complete an ICZM strategy during the pilot program. The lack of direct language in Hua’s report may stem from the desire to not criticize the government, leaving capacity for further cooperation and action between these parties.

Despite this adversity, there were noted areas of success in Ba Rai Vung Tau. Key threats and issues were identified, local education projects were administered, and oil spill planning was explored (Hua et al., 2011). The exploration of local coastal planning issues is a success in itself. Although Va Ria Vung Tau was unable to implement an ICZM strategy, they still were able to bring stakeholders together to talk about local issues, starting a dialogue and the capacity for further action. Education in Ba Ria Vung Tau was through a program that aimed to involve the public in local estuary, water quality, and coastal sea dike studies. The purpose of the study was to identify areas that degrade local safety and quality of living. The last area noted for success in Ba Ria Vung Tau was the beginning of oil spill planning. An oil-spill plan outline was produced during the pilot program, and a plan was created to request international funding (Hua et al., 2011).

Vietnam’s National Climate Change Strategy

The most current policy directly addressing climate change and perhaps the most revealing as to Vietnam’s response to climate change is the Vietnamese *National Climate Change Strategy*. Until this point, Vietnam’s national level response was largely capacity and legal framework building. These tasks mark the beginning of Vietnam’s national level active response to climate change. Released in 2011, *The National Climate Change Strategy* was the first comprehensive national strategy to combat climate change (Khiem, 2014). The policy

defined ten “strategic tasks,” with subtasks, to help mitigate the effects of climate change. The first three tasks are active hand-on policies to address the physical threats of climate change, while the remaining seven focus on building adaptive capacity or overall climate response in Vietnam. While some strategic tasks set a timeline for accomplishing clear goals, others are vague or left open-ended. The following section breaks down each strategic task and searches to find how Vietnam is addressing each.

As a disclaimer, the length and scope of this study was very limited due to this project’s timeline and the lack of English source information. However, with the research help of Chi Kim Pham, a graduate student at National Yunlin University of Science and Technology in Taiwan and graduate in Maritime Finance at Vietnam Maritime University, and Google translation software, it was made possible to locate and analyze Vietnamese language sourced information. This provided vital insight into Vietnam’s response to climate change on topics where English sourced information was not available or was not accessible through western databases.

Strategic task one.

Section ‘A’ of the first strategic task aims to actively monitor and respond to disasters related to climate change by creating an early warning system and taking measures to reduce damage caused by disasters (Socialist Republic of Vietnam, 2011). In this task, Vietnam aimed to fully establish a climate and sea level rise monitoring system by 2015. Although they seem to have missed this goal, there is substantial evidence that Vietnam has started to establish a limited monitoring system. At least one study was conducted to determine the optimal placement of monitoring stations. Technology upgrade requirements were researched, and it appears that technological upgrades have begun. Data connectivity, a vital component for a monitoring network, was cited as a substantial barrier (Thur, 2018)¹.

¹ Vietnamese Source translated with the help of Chi Kim Pham and Google Translate

Section 'B' of the first strategic task focus on the reduction of damage caused by disasters through, disaster prevention and control structures, the 'four-on-the-spot' disaster management system, increased research of disaster prevention policy, and increasing forest coverage (Socialist Republic of Vietnam, 2011). Disaster prevention and control structures such as sea dikes will be covered briefly in later sections. Although Vietnam's educational system continues to expand and improve, there is little available information about domestic efforts to research policy regarding disaster prevention. Vietnam has shown progress in increasing forest coverage. That will be covered extensively in strategic task four. Perhaps the most integrated and developed approach of applied rapid-onset disaster management in Vietnam is the 'four-on-the-spot' disaster response system.

Four-on-the-spot.

Four-on-the-spot is a disaster preparedness and response motto and model. The program was created in the 1970s during the fortification of the Red River dike system (Joint Advocacy Network Initiative [JANI], 2010). Vietnam realized the need for the four points, leadership, human resources, mean and materials, and logistics to be present and engaged in disaster planning and mitigation. The expression "on-the-spot" refers to where these disaster preparedness and response activities should take place. To enable disaster response and preparedness across Vietnam, *four-on-the-spot* states that all lower levels of governance are responsible, household, commune, district, and provincial. The level of responsibility for each group before during and after the disaster has been detailed over time. All information about Four-on-the-spot is from The Joint Advocacy Network Initiative's (JANI) report *Four On-The-Spot Motto in Disaster Management: Key contents and actual application* (2010), the most in depth review of the system available to the author.

The household.

Before the disaster the household leadership should determine the risks that might affect the family (JANI, 2010). The family should inventory the “essential means, materials and household items” and which items need to be obtained. Preparedness tasks are encouraged to be given to each family member. This entails *human resources on-the-spot*. During the disaster the head of household should spearhead the family’s response by providing relief and leadership within the family. During and after the disaster, capable family members are expected to take a central role in the immediate response by conducting search and rescue within the family. They are also responsible for ensuring the family is ready to support the district or commune level response if called upon by local authorities. *Materials-on-the-spot* is defined as having the materials for “self-rescue and self-evacuation, such as boats, rafts, [flotation] devices ... life-jackets, [and] temporary shelters (JANI, 2010, p. 15).” The recommendations given to local populations gives insight to the high levels of danger and adversity these storms pose. *Logistics-on-the-spot* dictates that each household should have enough basic necessities such as food, water, light and cooking fuel, and medicine.

The local level.

The local government is required to set up a steering committee for disaster mitigation and response (JANI, 2010). Actors on this committee are local authorities, members from various agencies involved, such as MARD’s Flood Control Board, citizen and political organizations, and local armed forces. In the report, Dr. Nguyen Huy Hieu, Lieutenant General, asserts that it is necessary to appoint a leader to this committee to assure that activities proceed swiftly. Superior to this committee leader and all others is the leading member of the lower government agencies, the Chairman of the People’s Committee. There is a Chairman for each level of lower government, province, district, and commune. These Chairmen are responsible for overseeing the interagency response to disasters on-the-spot.

Human resources on-the-spot refers to the workforce capability to respond the wishes of the Chairman (JANI, 2010). These mobilized groups are often civil union members, security unions, police, and armed forces. They often carry out tasks such as assisting in preparation and recovery by protecting key structures, trimming trees, search and rescue, and facilitating evacuations. It is important to note that these forces are not necessarily responsible for saving the local populations. That duty is held by the family. Each family should “save themselves before saving other people nearby, and the government should rely on available resources (people) to rescue those in trouble (JANI, 2010, p. 12).” This means that citizens should be responsible and focused on the safety and evacuation of themselves foremost. If the government has the ability *on-the-spot* to help or condition become dire, they will do their best to respond.

Materials on-the-spot refers to the acquisition of necessary materials before and during the disaster to ensure the government’s ability to respond quickly (JANI, 2010). This includes mobilizing people, materials, housing, and machinery. For example, Junk Ships (and crew) may be needed for evacuations, housing may be required for shelters or child care, and materials and crews often help repair local sea dikes. *Logistics on-the-spot* refers to the duty of the local government to have on hand enough food, water, and health supplies to provide to local populations until external help can arrive.

The commune level

The commune level’s pre-disaster *leadership on-the-spot* goal is to ensure that groups involved in the response understand their role and contribute to strengthening the Steering Committee (JANI, 2010). In addition, they are to develop detailed natural disaster plans, ensure proper budget allocation for disaster response, conduct disaster response simulations, and actively track conditions in their commune during the response and preparation phases. *Human resources on-the-spot* responsibilities on the commune level are to identify relief agencies that

may assist in natural disasters, assign tasks to appropriate agencies, and ensure readiness of rescue skills. *Materials on-the-spot* tasks are to support the lower levels to help meet their materials goals. They do this compiling information on households, businesses, organizations, and others who own materials that might be needed during a disaster response. The communal government is authorized to borrow these materials to respond to natural disasters quickly.

Logistics on-the-spot responsibilities on the commune level is to educate populations on their role in disaster logistics, provide funds for sustaining evacuation points, and ensuring drinking water for at least seven days (JANI, 2010).

During the disaster, the commune leadership is expected to enact the developed disaster plan and tediously monitor the situation down to individual households and businesses (JANI, 2010). The commune is responsible for evacuating vulnerable households that don't have the means to do so, and for sending special forces to assist community members who decide not to evacuate. The commune is instructed to, "actively and closely coordinate with the upper levels of government and armed forces present in the area to organize the rescue work" (JANI, 2010, p. 19). *Human resources on-the-spot* is provided to the commune by "youth response teams, civil militia, and self-managed groups" (p. 19). These groups, at the direction of the commune, provide support to local populations. Local utilities and service providers work independently by initiating sector disaster plans. An interesting part of this plan is that although it is made very clear that people are responsible for saving themselves, the duty of the commune to help evacuate and "actively support" these populations is clearly expressed multiple times (p. 19). The commune is also responsible for ensuring that access points to vulnerable areas are guarded and patrolled. *Materials on-the-spot* is simply to borrow or commandeer the previously inventoried private equipment and materials to ensure that the commune can respond to the

situation. *Logistics-on-the-spot* entails making sure that evacuation facilities and sites have adequate supplies and actively tracking the situation to ensure a proper response (JANI, 2010).

After the disaster the commune *leadership on-the-spot* is directed ensure that population's basic needs are met, provide continued support for recovery, provide guidance to utility providers, ensure environmental clean-up, and coordination with external supporting organizations (JANI, 2010). *Human resources on-the-spot* after the disaster is defined as supporting the rebuilding effort of lower levels, down to the household. They should also ensure relief items and services are quickly provided and help in the environmental clean-up. *Materials on-the-spot* is responsible for ensuring that they, with outside support, support utilities to restore services clear and repair roads, bury dead animals, and ensure the water system is chemically treated. *Logistics on-the-spot* will support all other areas of the relief effort and "find appropriate livelihood recovery options" (p.23). The fact that the government goes as far as to ensure the locals are economically sustainable after the disaster is substantial and demonstrates the government's commitment to the resiliency of local populations.

Strategic Task Two.

The second strategic task addresses the food and water security of the country. Vietnam plans to address food security by ensuring the land remains agriculturally viable and by studying and implementing more efficient agriculture and animal husbandry techniques (Khiem, 2014). Making sure that land stays productive "in each region and locality" is an emphasis of the food security plan (Socialist Republic of Vietnam, 2011, p. 69). This is important because in and between Vietnam's two deltas, there lie very diverse landscapes. The threats Vietnam faces to food security are in these regions are likewise diverse. Vietnam's plans to locally address and mitigate these food security threats, a major climate change issue, displays an understanding of the importance of integrated management and local capacity building. Information was not

readily available about progress on local food security plans. It is reasonable to assume that this is lack of accessible information is because these plans will likely be created and implemented by local steering committees and guided by a sub-division of MARD or MONROE. These steering committees are much less likely to publish English resources or reports, be picked up by Vietnamese national media, or be covered by any foreign research or media. Vietnam has taken action to ensure that the land remains agriculturally productive through mangrove restoration, sea dike construction and other methods. Although information is lacking in these sections as well, they will be covered in later sections.

When it comes to more effective agriculture and husbandry techniques, Vietnam plans to “develop and perfect a pest and disease control system for crops and livestock in the context of climate change” by the year 2020 (Socialist Republic of Vietnam, 2011, p. 69). Information pertaining to progress on this goal was not readily available. In a great display of Vietnam’s integrated approach, part of the agricultural strategic plan also addresses poverty and vulnerability of coastal populations. This section explains that Vietnam seeks to “formulate mechanisms and policies to strengthen the insurance and risk-sharing system in agriculture” (Socialist Republic of Vietnam, 2011, p. 69). This is an important part of Vietnam’s response to climate change. As discussed earlier in this thesis, Vietnam has large numbers of rural populations that are at risk of being severely impacted by climate change or other related disasters. It is apparent that the government of the Socialist Republic of Vietnam understands that addressing the security of these populations is paramount in successful climate change response. Information pertaining to Vietnams progress on these issues was not available.

The second half of the second strategic task concerns water security. Water security is under threat by upstream dams, logging, and other factors that result in the degradation of water quality (Socialist Republic of Vietnam, 2011). This is to be managed by increased monitoring of

resources, increased international engagement and cooperation, and expansion of integrated planning of water resources nationwide (Khiem, 2014). Information on the increased monitoring or integrated planning of water resources is not available to the author at this time.

One interesting part of the water resource policy set forward in strategy is how it seems to group inter-related tasks holistically. For example, one subsection of the policy states that Vietnam is “to renovate, upgrade, reinforce, and construct irrigation works, hydropower plants and river and coastal sea dike systems to effectively respond to flood, droughts, sea level rise and saltwater intrusion in the context of climate change” (Socialist Republic of Vietnam, 2011, p. 70). It is interesting and revealing that Vietnam groups water security as flood prevention water resource security, and saltwater intrusion under the same strategic task subpoint. One reason that might explain this grouping is the fact that all of these structures, upstream and domestic dams, levees, and sea dikes, seem to be under the jurisdiction of a subgroup of the MARD, the Department of Dike Management and Flood Control (Kelly, 2015). By grouping the tasks according to implementing agency, Vietnam will be able to quickly separate tasks among the government and appropriate Ministries.

The most visible way that Vietnam has been addressing water policy is through the Mekong River Commission. However, as early as 2007 groups have claimed the organization is weak and unsuccessful at stopping dam projects or deterring new projects (Deutsche Presse-Agentur [DPA]. (2007). According to an article from September 2018, Laos has recently release plans to build an additional dam on the Mekong River (“Vietnam-Laos: Mekong River Commission Implements Consultations on Lao Hydropower Project”, 2018). Although Mekong River Commission member countries and regional stakeholders met to express concerns about the project, there is no evidence that these negotiations had any positive effect for Vietnam or the people of the Mekong Delta. Overall, Vietnam has not demonstrated an ability to deter projects

detrimental to the Mekong Delta through international institutions. Likewise, there has been no indication of Vietnam projecting its power on upstream countries to deter these development projects.

Strategic Task Three.

The third strategic task concerns the proactive adaptive preparation for sea level rise in Vietnam. On the social side, Vietnam plans to predict vulnerable areas to sea level rise across the country. They then plan to use this information to develop socio-economic master plans regarding the response to climate change in each jurisdiction. Vietnam will use this information to analyze “livelihoods and production processes” of affected populations, to develop new methods in the climate change era (Socialist Republic of Vietnam, 2011, p. 70). On the physical side of Strategic Task Three, Vietnam plans to bring “important sea and river dike sections for minimum protection against typhoons of scale 9 (Socialist Republic of Vietnam, 2011, p. 70).” The reference to scale 9 is a Beaufort Wind Scale measurement that equates to a strong gale on international standards or a Tropical Storm on the Saffir–Simpson scale. These storms frequently produce waves six meters high on open water and winds between thirty-four and forty-seven knots-per-hour (Maloney, Janssen & Eaton, 2013). This is a formidable goal, but one with great reward. It is important that Vietnam is addressing both the social and physical aspects of climate change, as it displays the holistic and integrated approach of the Vietnamese response to climate change.

Vietnam has invested in education and international partnerships that have greatly expanded their integrated planning capacity, GIS and remote sensing capabilities, as well as expanding and upgrading their sea dike infrastructure. These partnerships for increasing GIS, remote sensing, and integrated approach capabilities were covered in previous sections. The expanding and upgrading of sea dikes in Vietnam have been occurring for decades, many times

with international assistance. In the early 1990's the World Bank helped finance the Quan Lo-Phuong Hiep project that helped fortify the Ca Mau Peninsula (Vinh, 2018)². And in the early 2000's the World Food Programme helped fortify three-hundred-and-eight kilometers of coastline in the Red River Delta provinces of Hai Phong, Quang Ninh, Thai Binh, Nam Dinh, and Ninh Binh (Embassy of the Socialist Republic of Vietnam in the United States, 2000).

Although there is no comprehensive view of Vietnam's sea dike improvement, Vietnam's ability to harness expertise and financial backing from the international community shows that it is increasing capacity and making significant progress to fortify the coastal zone.

Strategic Task Four.

Deforestation has occurred in Vietnam since the colonial time (Cochard, Ngo, Waeber & Kull, 2017). The Indochina Wars accelerated this rate substantially, resulting in the loss of fifteen to twenty-three percent of forest land. However, neither of these compared to the post-Vietnam War (American War) privatization and exploitation of the forests. Strategic Task Four aims to protect the remaining forest to increase biodiversity and enhance greenhouse gas (GHG) absorption, but Vietnam has been working to increase forest cover long before this strategic task was asserted (Socialist Republic of Vietnam, 2011). Two programs, between 1993 and 2010, are credited the success in reforestation, Greening the Barren Hills Program (1993– 1998) and Five Million Hectares Reforestation Program (1998–2010) (Cochard, Ngo, Waeber & Kull, 2017). These programs, in addition to other efforts across Vietnam, resulted in forest cover increasing substantially. In fact, by the year 2013 it was estimated that forests in Vietnam had recovered to levels not seen since 1943. Strategic Task Four, initiated in 2010, called for forest cover to be increased to forty-five percent. By 2013, Vietnam had already achieved forest cover rates of forty-one percent. This shows impressive progress on reforestation in Vietnam.

² Vietnamese Source translated with the help of Chi Kim Pham and Google Translate

Strategic Task Five.

Task Five aims to develop renewable energies and improve energy efficiency and conservation. Vietnam planned to increase renewable energies by exploring and researching all types of alternative energy and by increasing renewable energy sources to five percent of the national capacity by 2020 (Socialist Republic of Vietnam, 2011). By 2050 Vietnam planned to increase this number to eleven percent. Vietnam quickly surpassed these goals. In 2015, renewable energy was estimated to be nearly five and a half percent of total generation (Deutsche Gesellschaft für, & Internationale Zusammenarbeit [GIZ], 2018). Hydropower, not classified as a renewable resource by Vietnam, was planned to be increased by 20,000 – 22,000 megawatts by the year 2020 (Socialist Republic of Vietnam, 2011). In 2015, hydropower accounted for a staggering 37.3 percent of all power generated (GIZ, 2018). Much of this success can be traced to a project that since 2009, has allowed Germany to aid Vietnam in improving energy efficiency and in expanding its renewable energy sector. The result has been a booming wind energy sector that has captured international attention (Perera, 2018). The goals of these programs are ambitious. Vietnam plans to increase wind and solar power to 800 megawatts and 850 megawatts by the year 2020 (Socialist Republic of Vietnam, 2011). By the year 2050, Vietnam plans to increase those numbers substantially to 6,000 megawatts for wind power and 12,000 megawatts for solar (GIZ, 2018). To put this into perspective, by 2050, twenty-one percent of Vietnam's power is planned to be generated from renewable sources (Socialist Republic of Vietnam, 2011).

Strategic Task Six.

Six aims to increase the role of the multiple levels of government in climate change response. One way this is to be done is by “improving and strengthening” institutions and by developing strategies and action plans for climate change issues (Socialist Republic of Vietnam,

2011, p. 73). The central government of Vietnam expresses in this section the need to “review and adjust socio-economic development strategies, master plans and plans of ministries, sectors, and localities” (Socialist Republic of Vietnam, 2011, p. 73). These plans will also be used to develop regional construction and zoning requirements to ensure sustainable development. Vietnam hopes to solidify the creation of climate change resilient “sustainable economic zones” by 2030 (p. 73). This is a great example of Vietnam’s integrated approach to addressing socio-economic issues and other climate change threats. Strategic Task Six also calls for the adjusted plans to be made public by 2015. Although the author was unable to find information relating to these plans, this is expected. It seems unlikely that these would be translated into English as they are not only internal documents, but in a way, a critique of the lower government.

Another important aspect of Task Six the push to strengthen institutions within the Vietnamese government. The Vietnamese successfully created the National Climate Change Committee, a key part of the strategic task (United Nations Development Programme, 2018). The Committee acts as an advisory board to the Prime Minister on climate change issues and to assist in the study of climate change policy and response. Specific instruction is given in multiple areas of Task Six to ensure that the response is inter-disciplinary and engaged by the government holistically. The Task also stresses the need to create systems and policies to encourage local populations and non-governmental organizations to help support climate change related adaptations.

Strategic Task Seven.

Strategic Task Seven address improving community climate change response abilities. The Task aims to do this in three ways, by helping communities respond to climate change, upgrading the healthcare system nationwide, and through education (Socialist Republic of Vietnam, 2011). Vietnam plans to enable communities to respond to climate change by

increasing grassroots organization and community local capacity and involvement. Special emphasis is placed on promoting local knowledge in climate change adaption. Vietnam's second aim of Task Seven is the improvement of the healthcare system. Specifically, Vietnam plans to upgrade facilities, equipment, and training methods for the healthcare system. They also have taken on the ambitious goal of ensuring access to basic health services to all citizens by 2020. The third aim of this strategic task is the education aspect of building community response and resilience. This is to be done by raising awareness of climate change issues throughout the community and by creating new ways to disseminate climate change information quickly to different stakeholders, policy makers, and community members. Educational programs should also incorporate climate change topics into educational programs and create programs to produce quality graduates in relevant fields.

Strategic Tasks Eight through Ten.

Task Eight aims to increase the technical capacity of Vietnam's advanced sciences to adequately address climate change risks. Strategic Task Nine encourages the promotion of international partnerships to continue to grow the countries capacity to respond to climate change. Task Ten directs the government to diversify international financial and technological support, to better coordinate with domestic and international resources, and to further encourage domestic and international organizations', corporations', and institutions' financial assistance to the climate change response.

Vietnam's Fisheries Master Plan

In 2013, Vietnam published its fisheries master plan to the year 2020. The objectives of this plan are to ensure the modernization of the aquaculture industry to increase sustainability, quality, productivity, and exports (Giang, 2017). Despite climate and other related threats mentioned in earlier sections, Vietnam predicts its 2020 output to increase to seven-million tons,

with aquaculture making up sixty-one percent. The remaining thirty-five percent will be from fisheries, with large scale expansions planned for offshore fisheries. Vietnam plans to establish six large scale fishing hubs in Hai Phong, Da Nang, Khanh Hoa (Nha Trang), Bia Ria-Vung Tau, Kien Giang, and Can Tho. These fishing centers will each be responsible for exploiting fisheries in specific a maritime region. It is important to note that these maritime regions often lie within contested waters. For example, Da Nang is tasked with the East Sea (South China Sea) fishing grounds. These areas, and the East Sea in particular, have been a hotspot for Chinese-Vietnamese conflict in recent years.

Analysis of Vietnam's Response to Climate Change.

The Strategic Tasks and fisheries maritime mater plan set forth by Vietnam in 2011 adequately address most of the complicated and deeply interrelated threats of climate change. They address issues across the spectrum from coastal areas to the highlands, from social issues to physical action. Issues are approached from a multi-level capacity building angle while still defining clear goals on the ground. Due to the scope of this thesis and the lack of English source material, more research is needed to survey the large-scale response to climate change. However, it is certain that Vietnam's response is making a difference. Thousands of kilometers of coastline have been fortified or restored. Forrest cover is the highest it's been in decades. Vietnam's agriculture and fisheries industries continue to expand exports. Offshore fisheries have and will continue to increase in size and importance as the Mekong river's flow continues to be restricted, killing river fisheries and aquaculture vital to the local food security. This will force brown water fishermen out of the Mekong delta or further into green and blue water fishing grounds. Thus, the question arises. How will this effect Vietnam's relationship with its neighbors?

What challenges might Vietnam face while combating climate change?

The purpose of this section is to look at the future challenges Vietnam may face while responding to climate change. This section will look exclusively at challenges related to previously discussed climate change threat responses and attempt to find ways in which this may affect the security of Vietnam. This is not intended to be a complete view of the subtopics within but a view of how Vietnam's response to climate change may affect these topics.

Food security

Food security has been an emphasis of Vietnam's response to climate change. The country is well aware of its climate threats and has taken adequate measures to ensure the agricultural viability of land throughout the country. Vietnam's largest export is rice and its second largest export is seafood. Although these sources are expected to become further strained in coming years, it is unlikely that this will heavily impact food security in Vietnam. This is because of the large scale of production for export. It is much more likely that Vietnam will see a large drop in revenue from rice cultivation and aquaculture. The large drop in rice cultivation will likely come from a loss of the 'third' crop. There is expected to be a slight increase in aquaculture is expected because as agricultural land becomes too salty to grow crops, Vietnamese farmers often turn to aquaculture. However, in years of heavy drought even these changes can be in vain.

A great example of the threats Vietnam faces to food security is the South East Asian Drought in the years 2015- 2017, which heavily impacted Vietnam. During the 2015 to 2017 years, the Mekong Delta experienced one of the worse drought events on record (ReliefWeb, 2018). This resulted in a massive humanitarian situation in Vietnam. The widespread destruction of aquaculture and agriculture in the region due to the lack of rain and increased temperatures was substantial. Two million people in eighteen provinces were in need of assistance due to the lack of drinking water and food security. The area also experienced an increase in disease and

pests throughout local agriculture and aquaculture, further degrading the situation (“Vietnam: Drought Devastates Local Shrimp Industry”, 2016). Vietnam felt its ability to respond to this event was insufficient, thus it appealed to the international community in March of 2016 (ReliefWeb, 2018). In April of the same year, The United Nations Responded by providing a 48.5-million-dollar plan to address the South East Asian Drought. This event was attributed El Nino conditions in the Southern Pacific Oscillation. These conditions are cyclic, occurring every few years, causing diverse effects across Vietnam and the world (Ahrens, 2007). This means that similar events will certainly happen again. It is imperative that Vietnam plan accordingly to ensure it is able to respond quickly to affected populations in future El Nino events.

Migration trends

Internal.

Planned internal migrations have occurred in Vietnam since the Tran and Nguyen Dynasties (Entzinger & Scholten, 2016; Church, 2017). The post-Vietnam War era saw large numbers of populations moved from urban-to-rural settings, particularly in the South (Entzinger & Scholten, 2016). However, since the economic revolutions of the Doi Moi policy in 1986, there has been a strong increase in rural-to-urban migration in Vietnam. But to what extent has climate change played a role in these migrations? How much of this migration can be attributed to the increased economic opportunity offered in the cities? It is difficult, if not impossible, to separate the economic migration from the climate driven migration, because climate change is directly affecting the economic stability of these communities by interrupting rice yields and other important economic drivers in the region. Likewise, workers within the city often make five to seven times as much as their rural counterparts.

Currently in Vietnam, the Mekong Delta sees the highest levels of outward migration (Entzinger & Scholten, 2016). Most of these migrants move toward Ho Chi Minh City, the

largest economic engine in southern provinces of Vietnam. Other notable areas of internal migration were found to be from the central coast to Ho Chi Minh City and Red River Delta to Hanoi. A study conducted by the International Organization for Migration concluded that migration was often done by members of the family unit to increase and diversify income within the household (Entzinger & Scholten, 2016). Most family units maintained the original family household. Although the government has been supportive of the migration process, seeing it is a mechanism to respond to climate change, Vietnamese laws have made migration difficult. When a migrant arrives to a new city, they are required to register in the new commune to receive healthcare and other services. If the registration is not possible, due to the lack of paperwork or other reasons, the migrant is forced to return home empty handed or to live without services. The result has been that an estimated twenty-one percent of the population of Ho Chi Minh City is now migrants. In responding to this, Vietnam has made efforts to improve the efficiency of internal migrations and has even facilitated migrations in the past. The most recent example of a large-scale government resettlement program was between 2009 and 2013. In this program, over 90,000 at risk family units were moved from the climate change prone areas within the Mekong Delta (Entzinger & Scholten, 2016). This shows not only Vietnam's commitment to the climate change response but the residents of the Mekong Delta, even if that means adaptation through migration.

External.

The focus of this section is to explore how populations may turn to emigration to cope with climate change. Populations in the southern regions of Vietnam have been migrating to countries such as Germany, the United States, Canada, Australia, Korea, and other countries since the Fall of Saigon. This started with the infamous helicopter evacuations and 'boat people'

and has continued through education, marriage, and other legal migration avenues ever since (Entzinger & Scholten, 2016).

It is unlikely that Vietnam will see an increase in external migrations along its land borders. Not only are migrants more likely to find economic opportunity in Vietnam, but neighboring countries would not be welcoming to large migrant populations. The closest and most likely destination for land-based migration from the Mekong Delta is Cambodia. However, treatment of Vietnamese communities within Cambodia are often mistreated. In fact, in recent years Cambodians have begun the forced repatriation of ethnic Vietnamese (Board, 2017). Between 2014 and 2017 more than 70,000 ethnic Vietnamese had their documents seized by the Cambodian government, claiming they were improperly issued. There were also numerous reports of Vietnamese being killed or their businesses or homes being destroyed by angry Khmer mobs. During the same period more than 10,000 people were forced back to Vietnam, and the repatriation continues to this day. Many of these people have lived in Cambodia all their lives and some only speak Khmer. Some experts have blamed this anti-Vietnamese sentiment on a larger plan to rile up nationalist and anti-Vietnamese tendencies to harness votes. Whatever the cause, it is clear that Vietnamese migrants are not welcome in Cambodia, and new migrants will be forcefully sent back to Vietnam. Vietnam objected to the violation of its ethnic population's rights within Cambodia, adding that the two countries currently enjoy good relations (Nguyen, 2017b). The Cambodian Interior Secretary's response however, simply asserted that they will not take the path of Pol-Pot regime. Vietnam invaded Cambodia and ousted this regime in 1978 after border skirmishes and the genocide of more than 1.8 million people, many of whom were non-Khmer minorities such as Vietnamese.

External Conflict

Cambodia.

Since the 1989 withdrawal from Cambodia, Vietnam and Phnom Penh have enjoyed good relations. In fact, Vietnam has become one of Cambodia's closest allies, and by far the closest by distance. This, however, may be changing. Vietnam's politburo has expressed its displeasure with the Hun Sen even going as far as demanding that he steps down from power (Board, 2017). Vietnam has expressed its displeasure with human rights violations within Cambodia. In addition to human rights violations against ethnic and citizen Vietnamese, which many attribute to Hun Sen's political nationalism, Hanoi has publicly voiced concern with the disbanding of the opposition party and Phnom Penh's increasing relations with China. Vietnam is certainly also losing patience with Cambodia over dams and development on the Mekong River that result in significant drops in water levels and quality.

Looking forward to at future relations with Cambodia in the context of Climate Change, it is clear that a sharp increase in climate-change inspired migrants crossing into Cambodia could ignite already tense relations. Any miscalculation by Phnom Penh could result in Vietnamese military intervention in Cambodia, which could in turn result in a retaliation by China. This has the potential to destabilize the entire South East Asian Peninsula, the South China Sea, the Gulf of Tonkin, and the Gulf of Thailand. Due to the Chinese threat, it is possible that Vietnam would peruse a coalition of countries to address the situation in Cambodia. By highlighting human rights abuses, it is likely that Vietnam could inspire foreign militaries to assist in the removal of Hun Sen.

China.

The most likely point of contention between China and Vietnam in the context of climate change is fisheries. As pointed out earlier in this thesis, scholars have asserted that the disputes in the South China Sea are deeply linked to the fisheries resources. These resources are seen as vital to the Vietnamese economy and food security. While China has become bolder and more

aggressive in defending its maritime claims in the South China Sea, Vietnam has not been deterred. Vietnam published its fisheries master plan in 2013, much after China's militarization and assertion of claims in the South China began.

Vietnam has also responded to China in the South China Sea by creating a more diverse and capable maritime defense forces (Ton, 2018). Vietnam's Coast Guard was created from the former maritime policing force. They are tasked with enforcing Vietnam's maritime claims, protecting sovereignty, ensuring maritime security and safety, search and rescue, and protecting Vietnam's resources. MARD also has created the Vietnamese Fisheries Surveillance Force (VFSF). The VFSF is responsible for enforcing Vietnamese fishing laws and sovereignty by "patrolling, detecting, inspecting, and prosecuting" individuals and vessels not adhering to Vietnamese fisheries law (Ton, 2018, p. 9). While these forces are not capable of competing with China's extensive naval capacity, it shows Vietnam's commitment to defend its maritime resources, even if it means facing the wrath of China.

Internal conflict

Vietnam has a long history of internal conflict. Historically, cleavage points have been between the northern and southern sects, as seen in the Vietnam war and the dynasty eras (Church, 2017). Increasing this division, in recent years, there has been an increase in prodemocracy activism, particularly in the south. Similarly, Vietnam's upper-class have started to display open willingness to criticize the government, as have some scholars and journalists (Thayer, 2011; Vinh, 2018). These facts paired with the Vietnamese tradition that natural disasters are signs from god that the ruling power has lost their "mandate from heaven" giving the people the right to an "uprising [of] a just cause," gives insight to the possibility of an internal uprising (Thayer, 2011, p. 32). However, the Vietnamese government has demonstrated a firm commitment to decentralization and an adequate capacity to respond to the climate change

and a diverse range of other threats. Thus, the likelihood of a significant internal uprising being successful is extremely unlikely, as the government still has the support of the vast majority of the Vietnamese population.

Conclusion

The climate change related threats Vietnam faces are diverse and pose equally diverse challenges and risks to the country. Large numbers of Vietnam's population depend on the agriculture, aquaculture, and freshwater sources that are threatened by climate change. This is threatening food and economic security of the country. This thesis sought to find climate change's effects on Vietnam because it is important to observe out how Vietnam plans to address these risks, as policy experts need to understand the challenges that may arise while addressing these risks. Specifically, this thesis sought to answer the questions: How is Vietnam addressing climate change? What challenges might Vietnam face while combating climate change? What future problems may arise from climate change?

To answer these questions, we first identified the many of the direct impacts of climate change. The impacts of climate change are diverse. The scope of this thesis did allow this thesis to be comprehensive in its survey of threats. Instead it created a holistic view of the challenges that Vietnam faces in the climate change theatre. We found that storm surge, sea level rise, erosion, and drought were causing and intensifying saltwater intrusion, which in turn was killing aquaculture and agriculture alike. Furthermore, We discussed the vulnerabilities of coastal infrastructure and populations.

How Vietnam is responding to climate change was explored through looking at the disaster prevention and management response as a whole. This meant seeking to find how each level of government was involved in the climate change response both physically and socially. We explored the tactics used in Vietnam such as *four-on-the-spot*, integrated planning, the

Strategic Tasks, and the fisheries master plan. The threats were broken down by Vietnam's response to these threats and we sought examples of action toward goals listed in Vietnamese climate response policy.

Finally, we sought to create a view of what Vietnam's future threats may arise from climate change related threats. Food security was the first major threat. Because nearly every climate change impact directly affects the food supply of the country through fisheries or agriculture, food security is the most pertinent threat facing Vietnam. As found in earlier sections, Vietnam has responded adequately, continuing to increase outputs and exports despite adversity. The second threat explored was internal and external migration. Our research found that Vietnam and most Vietnamese families do not regard integral migration as a threat, but as a tactic to help households diversify income and respond to climate change. External migration, however, does pose a significant threat to the stability of the region. Vietnam's closest neighbor from the Mekong Delta is Cambodia. Anti-Vietnamese and anti-migrant nationalism are ramped in Cambodia. Any substantial migrant flow is certain to provoke a response from the local Khmer population, and retaliation from the Vietnamese. This could drag China into a conflict on the South East Asian Peninsula that could destabilize the region for decades. Lastly, we looked at the competition for fisheries with China in the South China Sea, and the potential for increased tensions and conflict.

Further Research

Further research is needed to discover the full range of Vietnam's climate threats, response capabilities, and national security implications. Vietnam's climate threats are diverse and affect the entire country. More research is needed to create a more accurate view of climate change threats throughout this diverse landscape. Vietnam's response to climate change needs to be researched further as well, in aspects of both policy and action. It is clear that the government of

Vietnam is responding to the widespread threats of climate change with diverse action plans at multiple levels of government. Yet, the scope of this project only allowed for the analysis of two policies, both on the national level. More research is needed to create a comprehensive view of Vietnam's plans and actions. Because much of the source material for physical actions to mitigate climate change are often in Vietnamese, the ability to review source material in Vietnamese is a necessity to create this comprehensive view. More research is needed in the area of human migration from the Mekong Delta. Due to heavy anti-Vietnamese sentiments in Cambodia, the situation has the potential to destabilize the region if the threat is not mitigated. Lastly, Vietnam's response to its fisheries threats seem to put it at odds with the largest regional power, China. This relationship should be fully explored so that scholars may predict implications for security in the region.

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