

# THESIS

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2020

BUDAPEST BUSINESS SCHOOL  
FACULTY OF INTERNATIONAL MANAGEMENT AND BUSINESS  
INTERNATIONAL BUSINESS ECONOMICS  
CORRESPONDENCE TRAINING  
INTERNATIONAL BUSINESS SPECIALISATION

**THE IMPACTS OF CLIMATE CHANGE ON  
THE ECONOMIC DEVELOPMENT OF  
SOUTHEAST ASIA**

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Budapest, 2020

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## Abstract

Southeast Asia is among the fastest developing regions of the world. Unfortunately, it is also one of the most affected by climate change. Sea levels are rising, greenhouse gas emissions are on the increase and the number of natural disasters keeps rising. Typhoons, floods, and extreme weather conditions pose an immediate threat to the population of the region and its economy. In order to fight global warming and cover the cost of reconstruction after a disaster occurs, national budgets often need to be reallocated. Governments have to think out of the box, imply new policies, take part in international agreements to protect the environment so that they can secure the livelihood and basic human rights of their citizens. Community engagement is crucial to survival. This paper aims to bring attention to the various impacts of climate change on the economy of the region by showcasing examples that can serve as a relevant guide to see what may come in the future in other parts of the world as well.

Keywords: Southeast Asia, climate change, economy, disasters, Mekong dams, agriculture, adaptation, Thailand, Myanmar, Philippines, Vietnam,

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## 1. INTRODUCTION

The following thesis focuses on how climate change affects the economy of Southeast Asia. It presents an analysis of the economic struggles four of the ASEAN (The Association of Southeast Asian Nations) countries need to face because of climate change and represents the differences and similarities between them as well as their targets and approach. I believe that global warming and its consequences deserve much more attention since the number of climate-related disasters keeps increasing in the region and the shift in seasons and extreme weather conditions have a serious negative impact on economic development. Southeast Asia is expected to be seriously affected by the adverse impacts of climate change since most economies are relying on agriculture and natural resources like water. As a result, the national budget often needs to be reallocated to handle unexpected events occurring due to climate change.

Rising sea levels, floods, and typhoons are becoming more common and intense in Southeast Asia. Due to the long coastlines and heavily-populated low lying areas about 640 million people are in immediate danger. Over the past few decades, the greenhouse gas emission of developing countries has significantly increased, not to mention how strongly the region relies on coal and oil. These factors put huge pressure on governments to act quickly and find feasible methods to adapt to climate change.

Southeast Asia consists of 11 countries: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor Leste, and Vietnam. Considering the possible length of this paper and the vagueness of the topic, I have decided to narrow my research down to four countries: Thailand, Myanmar, the Philippines, and Vietnam. As a result, other countries of the region – for example Singapore, Cambodia, or Lao – have been left out of my research but they do appear in the form of brief examples.

Figure 1: Map of Southeast Asia



Source: <https://libraries.indiana.edu/file/southeast-asia-map>

According to an article published by the International Monetary Fund, the Philippines, Vietnam, Thailand, and Myanmar have been among the top 10 countries most affected by climate change over the past 20 years.<sup>1</sup> This finding is also supported by the Global Climate Risk Index 2018.<sup>2</sup> My decision to make these four countries the center of my paper was based on these statements. However, I have put a greater emphasis on the Philippines and Vietnam. In my opinion, the Philippines serve as a fine example of when economic and environmental interest clash and decision-makers need to choose between the two. The community response in the country is also quite remarkable. As Vietnam is the fastest growing economy of the region and it is also among the top 5 countries worldwide most likely to be affected by global warming, I have felt that it deserves a deeper analysis by introducing how the country's economy developed due to the political reforms and the threats the country needs to overcome.

This study aims to give an overview of what challenges this region needs to face and how it affects not only the economy but also the existence and accessibility of basic human needs such as food and water security and livelihood. We can see the different ways governments handle issues, what the main policies are, what strategies they implement, and how communities react and come up with solutions of their own to fight climate change.

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<sup>1</sup> 2020. [online] Available at: <https://www.imf.org/external/pubs/ft/fandd/2018/09/southeast-asia-climate-change-and-greenhouse-gas-emissions-prakash.htm>.

<sup>2</sup> Germanwatch.org. 2020. [online] Available at: <https://germanwatch.org/sites/germanwatch.org/files/publication/20432.pdf>.



## **1.1. Research Method**

The data used in this paper comes from comprehensive country studies for the above mentioned four countries and primary resources from embassies and researchers. The structure of the dissertation is straightforward. It starts with a general overview of the economy of Southeast Asia and the region's climate change vulnerability with a brief overview of Indonesia. The next section introduces the importance of the Mekong dams and their impact on biodiversity and questioning the justification of hydropower dams as a source of renewable energy. It continues by separately analyzing the previously mentioned four countries (Thailand, Myanmar, the Philippines, and Vietnam) based on the following aspects: general economic indicators, main export, and import products, and trading partners which is followed by the USAID climate risk profile. Then, I continue with a thorough literature review representing not only general concerns but specific cases and individual solutions. I have gathered most of the literature used from the database of the University of Glasgow. These studies were published by highly recognized researchers of the field and even some of them go back in time a few years, one can draw long-time conclusions from them. Besides, I have used current literature mainly from trustworthy online resources (International Monetary Fund, World Bank, United Nations Development Programme, Asian Development Bank).

In my research, I aim to provide answers to the following questions:

1. How the effects of climate change impact the economic development of the analyzed countries?
2. Do economic development and environment protection align with each other?

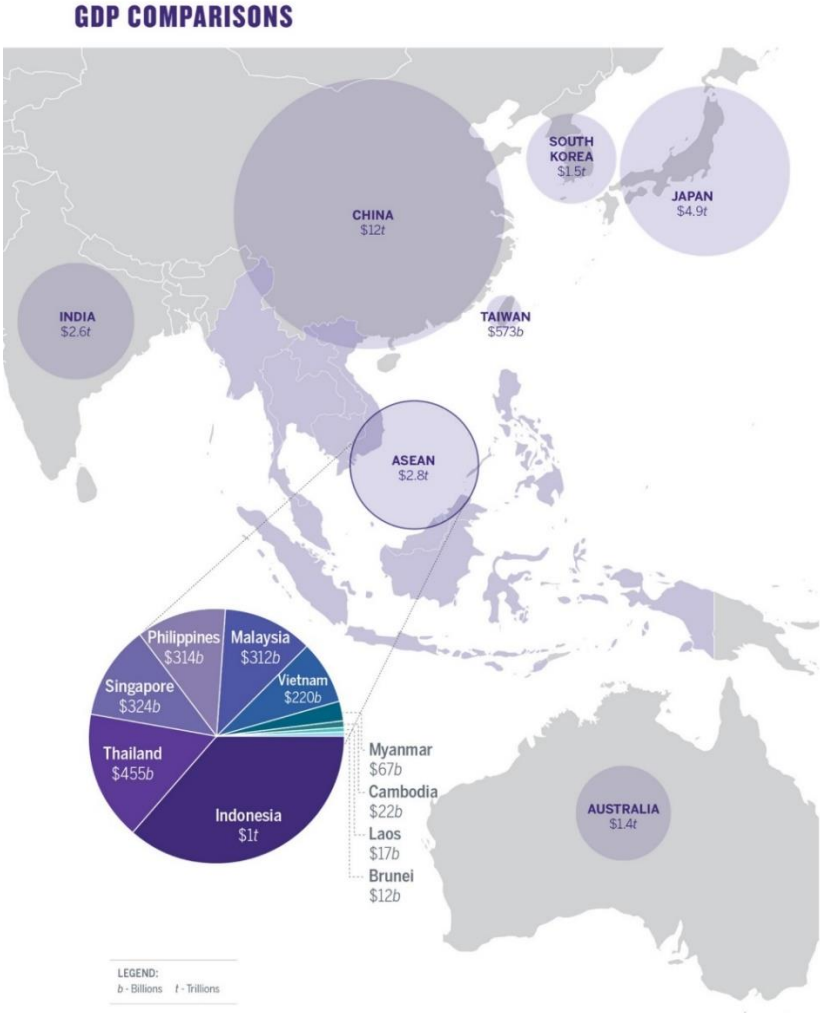
Please note that I have originally intended to conduct interviews on the matter with embassies and consulates but was unable to do so due to COVID-19. I have contacted a total of 29 embassies, organizations, and researchers from all parts of the world, including the USA and Australia, and of course from the countries analyzed. After recognizing that I would not be able to conduct any personal interviews, I have sent them my questions and received a response from only a few of the contacted individuals and organizations. With the exception of two researchers and two embassies, they did not answer my questions but sent a factsheet or some articles. Because of this, the primary research is not a separate section but is embedded in my analysis.

## 2. ABOUT SOUTHEAST ASIA IN GENERAL

### 2.1. The Economy of the ASEAN Countries at Present

The ASEAN Economic Community (AEC) was established in 2015 and has a combined GDP of 2.8 trillion USD and is the third fastest-growing Indo-Pacific economy after China and India.<sup>3</sup> The AEC aims to reduce or remove trade barriers to facilitate the free movement of goods, services, capital, and skilled labor within the region. Currently, Singapore is the only ASEAN country to have free trade agreements (FTA) with both the United States and the European Union. On a regional level, the ASEAN has FTAs with China, India, Japan, South Korea, Australia, and New Zealand.

Figure 2: GDP Comparison of the Indo-Pacific Region



Source: <https://www.usasean.org/why-asean/asean-economy>

<sup>3</sup> US-ASEAN Business Council. 2020. *US-ASEAN Business Council | ASEAN's Economy*. [online] Available at: <https://www.usasean.org/why-asean/asean-economy>.

Southeast Asia is considered to be one of the fastest-growing regions of the world. Still, according to data published by the Asian Development Bank, the region had grown less than anticipated in 2019 and this is partly due to the impact of the United States-China trade war.<sup>4</sup>

Figure 3: ASEAN GDP Growth 2019



Source: <https://theaseanpost.com/article/asean-growth-slower-forecasted>

Three of the ASEAN countries – Singapore, Thailand, and the Philippines- have seen a slight decrease in their GDP while Vietnam was one of the fastest-growing economies of the region. Even though its agriculture was being hindered by drought and African swine fever, foreign direct investment (FDI) rose by 27% in the first five months of the last year and Vietnam managed to reach its estimated growth. Only Cambodia and Lao were able to produce a higher GDP growth in 2019 with 7% and 6.8%.

<sup>4</sup> The ASEAN Post. 2020. ASEAN Growth Slower Than Forecasted. [online] Available at: <https://theaseanpost.com/article/asean-growth-slower-forecasted>.

Unfortunately, due to Covid-19, we can expect a sharp recession in all of the ASEAN economies in 2020.<sup>5</sup> For Indonesia, Philippines, Vietnam, Thailand, and Malaysia the IMF originally projected a 4.8% growth which has dropped to -0.6%. Vietnam can still expect 1.5% growth while Myanmar is expected to grow 2% and Cambodia 1%.

Figure 4: Projected GDP Growth for Southeast Asia

**GDP GROWTH AND PROJECTED GROWTH RATES FOR SOUTHEAST ASIA, % PER YEAR**

	2018	2019	2020 forecast				2021 forecast	
			IMF	ADB	WB Baseline	WB Lower-case	IMF	ADB
Southeast Asia	5.1	4.4		1.0				4.7
ASEAN-5*		4.8	-0.6				7.8	
Brunei	0.1	3.9		2.0				3.0
Cambodia	7.5	7.1		2.3	2.5	1.0		5.7
Indonesia	5.2	5.0	0.5	2.5	2.1	-3.5	8.2	5.0
Lao	6.2	5.0		3.5	3.6	2.2		6.0
Malaysia	4.7	4.3	-1.7	0.5	-0.1	-4.6	9.0	5.5
Myanmar	6.4	6.8		4.2	3.0	2.0		6.8
Philippines	6.2	5.9	0.6	2.0	3.0	-0.5	7.6	6.5
Singapore	3.4	0.7	-3.5	0.2			3.0	2.0
Thailand	4.2	2.4	-6.7	-4.8	-3.0	-5.0	6.1	2.5
Vietnam	7.1	7.0	2.7	4.8	4.9	1.5	7.0	6.8

\*The ASEAN-5 is Indonesia, Malaysia, the Philippines, Singapore, and Thailand.

Source: <https://www.csis.org/analysis/economic-toll-covid-19-southeast-asia-recession-looms-growth-prospects-dim>

It is quite interesting, however, that the ASEAN countries overtook the European Union as China’s main trading partner in the first quarter of 2020.<sup>6</sup> This has been attributed to the extended lockdown measures within the European Union with electronics being the main contributors to trade between China and ASEAN.

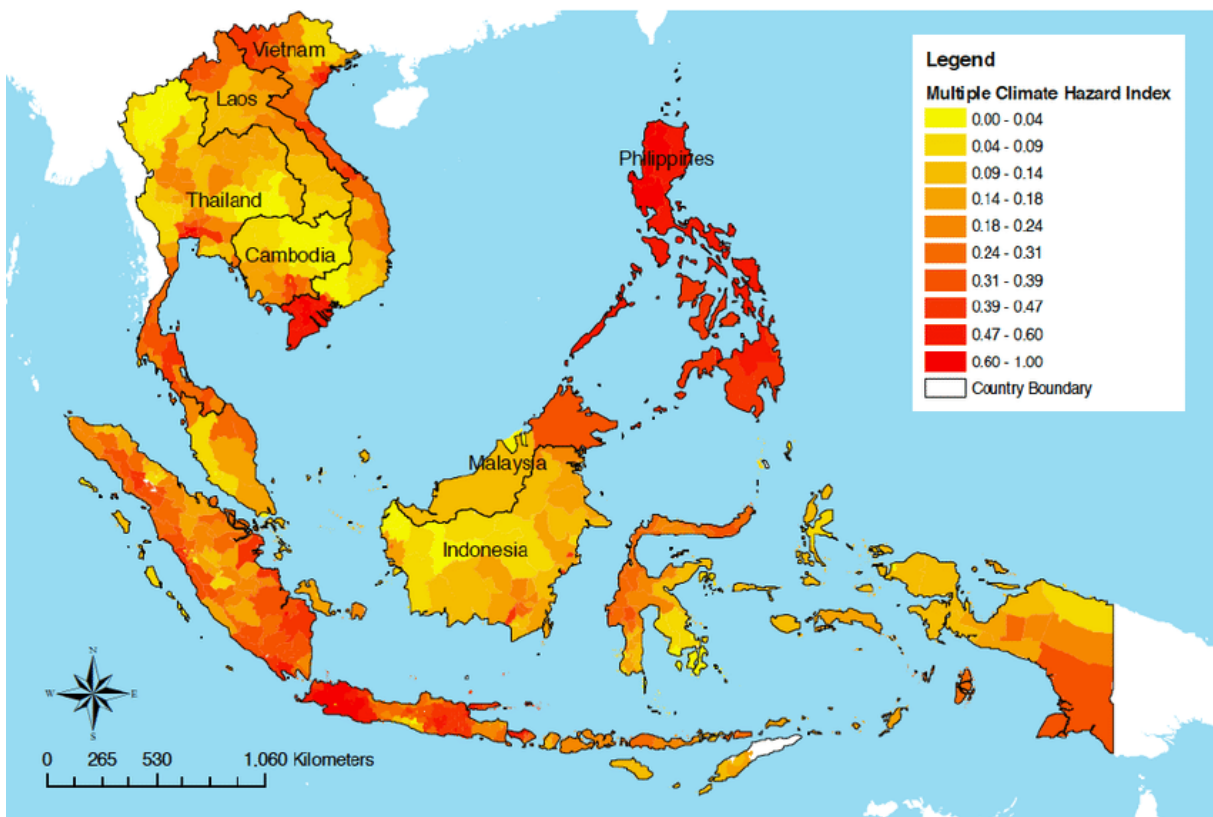
<sup>5</sup> Csis.org. 2020. *The Economic Toll Of Covid-19 On Southeast Asia: Recession Looms As Growth Prospects Dim*. [online] Available at: <https://www.csis.org/analysis/economic-toll-covid-19-southeast-asia-recession-looms-growth-prospects-dim>.

<sup>6</sup> Briefing, A. and Medina, A., 2020. *ASEAN Overtakes EU To Become China's Top Trading Partner In Q1 2020*. [online] ASEAN Business News. Available at: <https://www.aseanbriefing.com/news/asean-overtakes-eu-become-chinas-top-trading-partner-q1-2020>.

## 2.2. Major Threats

In 2015, the United Nations Framework Convention on Climate Change established the Paris Agreement according to which starting in 2020 warming needs to be restricted below 2°C and no more than 1.5°C by the middle of the century. All ten member countries of the Association of Southeast Asian Nations (ASEAN) ratified the agreement – including Myanmar, Philippines, Thailand, and Vietnam. By the time the Agreement was signed, ASEAN countries accounted for only 5% of the global greenhouse gas (GHG) emissions. Still, the region is projected to become the most energy-hungry region in the world.

Figure 5: Map of Vulnerability to Climate Change in Southeast Asia



Source: [https://www.researchgate.net/figure/Map-of-vulnerability-to-climate-change-in-Southeast-Asia-taking-into-account-exposure-to\\_fig1\\_270221053](https://www.researchgate.net/figure/Map-of-vulnerability-to-climate-change-in-Southeast-Asia-taking-into-account-exposure-to_fig1_270221053)

According to the forecast of the Asian Development Bank, Southeast Asia potentially could lose 11% of its gross domestic product (GDP) due to climate change by the end of the century.<sup>7</sup> To avoid such economic damage, the region needs a sharp transition towards a low carbon, sustainable economic system. Findings showed that the top sectors in dire need of investment are energy-efficient technologies and innovations, renewable energy and storage, and clean energy public transport systems. Interestingly, the top barriers in the transition to low carbon economy are lack of funding and insufficient policies. On the other hand, the main drivers in the transition are local government initiatives, business leaderships, consumer pressure, and purchasing habits.

Figure 6: Regional Prediction of GDP Growth Rate in 2020



Source: Asia Development Bank

Graphic©Asia Briefing Ltd.

Source: <https://www.vietnam-briefing.com/news/vietnams-economy-grow-fastest-southeastasia-despite-covid-19.html/>

<sup>7</sup> The Business Times., 2020. *Southeast Asia One Of The Most Vulnerable Regions To Climate Change: Eco-Business Report*. [online] The Business Times. Available at: <https://www.businesstimes.com.sg/asean-business/southeast-asia-one-of-the-most-vulnerable-regions-to-climate-change-eco-business>.

As per the previously referenced IMF article, by the end of the century, the region could shift to a new climate regime. This would mean that the coolest summer months would become warmer than the hottest summer months between 1951 and 1980. If we suppose that there will be no technical breakthroughs, rice yields could drop by 50% in Vietnam, Myanmar, and the Philippines by 2100, compared to 1990. Besides, in hotter weather certain diseases like malaria and dengue fever are much more likely to move towards northern countries as well.

Deforestation is another huge issue, especially in Malaysia and Indonesia. It is a major source of GHG emissions (almost half of Indonesia's total GHG emissions) as trees are cut down to make space for farms.

Urbanization is another great contributor to climate change as cities emit more heat. Cities are more vulnerable to floods as new construction in floodplains block waterways. The same applies to tourism: even though it creates jobs, it also indirectly contributes to coastal erosion. As a result of urbanization, energy demand can even grow by 66% by 2040. Coal is supposed to overtake natural gas in the energy mix.

As the economy strengthens and the population keeps increasing, the demand for transportation is also on the rise in ASEAN countries: projections suggest that it will rise by 60% from 2013 to 2040.<sup>8</sup> This significantly contributes to GHG emissions as transport already accounts for about 25% of the region's final energy consumption. As states have trouble finding sustainable transport solutions, ASEAN countries decided to take collective action. As per the ASEAN Transport Strategic Plan 2016-2025, they agreed to actively pursue sustainable transport. For instance, in Malaysia, there are great efforts to generate fossil fuels from renewable sources.<sup>9</sup> They aim to use palm oil as it has very low emissions as fuel compared to coal or natural gas. Yet, palm plantations route us back to a previously mentioned big issue: deforestation.

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<sup>8</sup> Bakker, S., Dematera Contreras, K., Kappiantari, M., Tuan, N., Guillen, M., Gunthawong, G., Zuidgeest, M., Liefferink, D. and van Maarseveen, M., 2017. Low-Carbon Transport Policy in Four ASEAN Countries: Developments in Indonesia, the Philippines, Thailand and Vietnam. *Sustainability*, 9(7), p. 1217.

<sup>9</sup> Klemeš JJ and others, "Energy, Water and Environmental Footprint Interactions: Implications for the Major Economy Sectors of Europe, South East Asia and Worldwide" (2016) 148 *Procedia Engineering* 1199. p.1201.

An article by World Politics Review criticizes Southeast Asian countries for not doing enough to fight climate change.<sup>10</sup> Even though governments publicly recognize climate-change-related threats and have developed several theoretical plans, in many cases there remain only plans and no real action is taken. Politicians in Thailand, Malaysia, Indonesia, and the Philippines concentrate on building short-term alliances. Some leaders even blame big powers. Even if they are right to a certain extent, this will not help to find a solution. Only Singapore – being a wealthy country – manages to carry out its plans.<sup>11</sup> Not only they are building dikes and stockpile sand, but they are also considering the use of underground space. As underground central heating systems are much more energy-efficient so they may put industrial facilities, transport, storage, and utilities underground. Food security is another issue they want to find a solution before it is too late. As of now, they import 90% of food products. As the government believes that traditional agriculture cannot long exist anymore in its current form, they set a target to meet 30% of the country’s nutritional needs with home-grown products. Since Singapore has advanced biotechnology and manufacturing, they plan vertical farming in the so-called agri-tech sector.

A lesser-known state of the region is Timor-Leste which is facing food and water scarcity due to climate change. An organization called WaterAid brought water and sanitation services to communities but these were damaged by landslides and floods 80% of the population relies on agriculture but they experience crop damages or failures as sea levels rise, rivers run dry and the dry season gets longer.<sup>12</sup> Almost half a million residents are affected. If corn does not grow anymore, residents only eat sweet potato and cassava.<sup>13</sup> Only the wealthy can afford rice. The country ratified its first-ever National Adaptation Programme of Action for Climate Change with the support of the United Nations Development Programme.

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<sup>10</sup> Kurlantzick J, “In the Face of Catastrophic Sea Level Rise, Countries in Southeast Asia Dither” (*World Politics Review* November 11, 2019) <https://www.worldpoliticsreview.com/articles/28333/on-climate-change-southeast-asia-isn-t-doing-enough>.

<sup>11</sup> (*Bloomberg.com*) <https://www.bloomberg.com/news/articles/2019-05-31/singapore-takes-action-on-climate-change-as-sea-levels-rise>.

<sup>12</sup> Silva Jda and others, “What Climate Change Means for Timor-Leste” (*WaterAid Australia*) <https://www.wateraid.org/au/articles/what-climate-change-means-for-timor-leste>.

<sup>13</sup> “A Small Country with a Big Climate Change Plan” (*UNDP in Timor Leste*) [https://www.tl.undp.org/content/timor\\_leste/en/home/stories/TL\\_NAPA\\_aileu\\_farmers.html](https://www.tl.undp.org/content/timor_leste/en/home/stories/TL_NAPA_aileu_farmers.html).



In case the negative impacts of climate change are not adequately addressed, the related vulnerabilities and socio-economic threats may undermine the region's poverty eradication and sustainable development efforts. According to the Asian Development Bank, if no action is taken four ASEAN countries (Indonesia, Thailand, Vietnam, Philippines – could even lose 6.7% of their GDP annually which is more than double the global average loss.<sup>14</sup> The World Bank classified 6 of 11 ASEAN countries as low or lower income. They are especially vulnerable since they do not have the necessary resources to take action efficiently. In Lao PDR and Cambodia more than one-third of the population suffers from multidimensional poverty. This means that besides having low income, they lack suitable houses and access to healthcare and education. On the other hand, high-income countries such as Singapore and Brunei have a high capacity to handle and manage natural hazards and have very little displacement risk.

Development Asia – which is an initiative of the Asian Development Bank – recommends some key measures to obtain the benefits from mitigation.<sup>15</sup> These include the reduction of deforestation (especially in Indonesia and Malaysia), the improvement of energy efficiency, and the usage of low-carbon technologies. Moreover, appropriate preparatory actions need to be undertaken, including strengthening institutions, research cooperation on clean technologies, and enabling green infrastructure. Redirecting investments is also an important feature: new zero or low-carbon power generation facilities, smarter power grids, energy-efficient buildings, and charging and refueling networks for electric and alternative fuel vehicles.

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<sup>14</sup> M. Rezaul Islam & Niaz Ahmed Khan (2018) Threats, vulnerability, resilience and displacement among the climate change and natural disaster-affected people in South-East Asia: an overview, *Journal of the Asia Pacific Economy*, 23:2, 299-309, DOI:10.1080/13547860.2018.1442153

<sup>15</sup> Raitzer D, “The Economics of Climate Change in Southeast Asia” (Development Asia February 28, 2020) <https://development.asia/policy-brief/economics-climate-change-southeast-asia>.

### 2.3.Indonesia

Even if Indonesia is not in the center of my research, I felt that this paper would not be complete with at least briefly mentioning this country as it is the largest economy of the region. About 40% of the country's population is at risk of natural hazards and the World Bank ranked Indonesia 12<sup>th</sup> among 35 countries that face high mortality risks due to multiple natural disasters.<sup>16</sup>

Due to the conversion of its forests and carbon-rich peatlands, Indonesia is the world's fifth-largest emitter of greenhouse gases.<sup>17</sup> The shift in land-use has ecological and social consequences as the country's forests are home to thousands of animal and plant species and 50-60 million residents depend on the forests as their livelihood. The government is determined to reduce its emissions by 41% by the end of this year and the USAID supports their efforts.<sup>18</sup> In 2019, they were the world's largest exporter of thermal coal.<sup>19</sup> As they want to close the "electricity gap" between the wealthy and less connected islands, they plan to increase their domestic coal-powered generation.

In the 2020 Climate Change Performance Index (CCPI), Indonesia ranked 39<sup>th</sup> in the list of low performers.<sup>20</sup> Even though it was able to improve its performance in the Energy Use category from a medium rating last year to a high rating, it was not able to maintain its medium rating in the GHG Emissions category. It is rated medium in renewable energy but its overall performance in climate policy was rated low.

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<sup>16</sup> "Climate Change Profile: Indonesia - Indonesia" (*ReliefWeb*) <https://reliefweb.int/report/indonesia/climate-change-profile-indonesia>.

<sup>17</sup> "Climate Change - Indonesia" (*World Resources Institute* October 1, 2013) <https://www.wri.org/our-work/project/forests-and-landscapes-indonesia/climate-change-indonesia>.

<sup>18</sup> "Indonesia" (*Climatelinks*) <<https://www.climatelinks.org/countries/indonesia>> accessed May 22, 2020

<sup>19</sup> "The Carbon Brief Profile: Indonesia" (*Carbon Brief* April 6, 2020) <https://www.carbonbrief.org/the-carbon-brief-profile-indonesia>.

<sup>20</sup> "Indonesia" (*Climate Change Performance Index* December 10, 2019) <https://www.climate-change-performance-index.org/country/indonesia>.

According to an article published in April 2020, Indonesia is not willing to make deeper emission cuts and the government focuses on economic growth.<sup>21</sup> Even if they meet their target to reduce emissions by 29% by 2030, they would still experience a temperature rise above pre-industrial levels. The following is a quote from Medrilzam, the head of the environmental department at the Ministry of National Development Planning:

*“This has been linked to our economic [growth] targets,” he said at a recent discussion in Jakarta. “These numbers will become our reference for the next five years. “Do we want to run after emissions reduction only and sacrifice the economy?” he added. “Do we want to cancel all coal mining contracts?”*

This refers to the government’s decision to not sacrifice economic growth for the sake of environmental protection. Climate policy advisers consider this decision extremely devastating and state they should rather focus on decarbonizing their economy.

## **2.4. Interview with Richard Doner**

I have contacted Richard Doner, who is an acknowledged researcher and a Professor Emeritus at Emory University in Atlanta, GA, USA. Due to his busy schedule, he was only able to provide me brief answers regarding the following questions which generally apply to the region.

- 1) Southeast Asia is among the most affected regions in the world regarding climate change. Could you please briefly explain what the main direct consequences are of climate change on the economy (agriculture, industry, tourism) and society (food security, famine, drought, etc.)?

*It’s first important to keep in mind that climate change problems have been exacerbated by national policies, ranging from the proliferation of automobiles to incursion into and destruction of CO2 absorbing and rain-absorbing forests. This is driven especially by efforts to expand agricultural exports, with palm oil being the principal but a not sole example. So the first thing is to go more deeply into the causes, the ways in which climate change, in general, has been exacerbated by specific regional and not policies. And another looming one, noted below, is Chinese*

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<sup>21</sup> “Indonesia Won’t ‘Sacrifice Economy’ for More Ambitious Emissions Cuts” (*Mongabay Environmental News* April 14, 2020) <https://news.mongabay.com/2020/04/indonesia-emissions-reduction-climate-carbon-economy-growth/>.

*dams on the Mekong. In that sense, it's probably useful to distinguish between climate change and human-induced environmental damage.*

*As to the effects: On agriculture – at one level agricultural exports have thrived and been one of the culprits. But more recently, a combination of flooding (due to deforestation) and, now, draughts, have created big problems, at least for Thai agriculture. Note also that the draughts in Thailand have been exacerbated by the diversion of water to the new Eastern Economic Corridor. Flooding of a couple of years ago also created huge problems for factories, although the country did a good job of getting those up and running. One area you to consider is the impact of coffee production in Vietnam – that monoculture focuses probably undermined food security, especially among hill tribes. Finally, the impact on tourism has not, to my knowledge, been significant, as reflected by what seems to be quite healthy tourist arrivals until the pandemic.*

- 2) How did the international trade of main export and import products change in the past decades? To what extent can this be linked to climate change?

*My sense is that there's been increasing intra-regional trade, especially in mfg., but I don't see where this has been affected by climate change.*

- 3) What do you think the biggest challenge is for economic development currently?

*The biggest challenge is to overcome the region's growing inequality. That means focusing more on the domestic market, increasing technical-vocational training, encouraging sustainable and diversified agriculture.*

- 4) What are the main climate-related policies in force in the region? What strategies do governments imply? Since when?

*The key point is in the second question: implementation. My understanding (and this is not my area), is that there are lots of good, climate mitigation policies on the books of various countries. The problem is in the pressures against their implementation. There's obviously a lot of research on the ways in which, say, Indonesian legal limits on burning forests for palm cultivation are violated in the face of corruption and weak regulatory agencies. This is in turn a result of several factors: influence of private interests, need for agricultural exports, decentralization.*

*On the other hand, one potentially important policy is the effort, especially in Thailand and Indonesia, to develop "eco-cars" that use fewer fossil fuels. This is now a major effort by these countries. I don't think this is happening in Vietnam or the Philippines.*

- 5) How much does the region lean on renewable energy?

*As mentioned above, there's a move to increase reliance on renewables in the automotive industry. But this may run up against big investments in petrochemical-related projects in Thailand, Indo, and Malaysia, as well as in coal-fired operations in Vietnam.*

- 6) Is there any significant change in domestic or international migration due to climate change?

*Most of the migration has been due to labor market issues (e.g. Burmese into Thai construction and fishing, Lao and Khmer into Thai rubber and construction, Burmese into Thai mfg., S. Asians into Malaysian and Singaporean construction and mfg.)*

***However, and this is quite important, I would anticipate more food insecurity and migration due to the construction of dams on the Mekong by China. This is absolutely crucial. So I think we'll see more migration due to human-induced environmental change than labor market causes.***

- 7) In what ways climate change affected biodiversity (extinction of endangered species or appearance of new ones)? What effect does it pose on the region's economy?

*I'm not sure about this, but certainly, mangrove destruction and some degree of pathogens in the fisheries are worth mentioning. Again, it's important to distinguish between climate change in general and human-induced environmental changes.*

### 3. THE TRUTH BEHIND THE MEKONG DAMS

#### 3.1. Chinese Dams on the Mekong

Figure 7: Mekong Dams in 2020



Source: <https://www.stimson.org/2020/mekong-mainstream-dams-as-of-january-2020/>

Before the Mekong River leaves China and flows into Myanmar, Thailand, Laos, Cambodia, and Vietnam, eleven massive dams turn off the tap for these countries.<sup>22</sup> Millions of people depend on the flow of the Mekong which generates 20% of the world's freshwater fish catch. These dams can extract sand, fish, and water from the river can also harm a fragile system. Last year, when Thailand, Cambodia, Lao, and Northern Vietnam experienced a devastating drought, China held back water from these countries and wiped out crops and fishing stock, bringing one of the world's great waterways to its knees.<sup>23</sup> It is important to note, however, that China is not the only country building dams on the Mekong. At one point, the river was five meters lower than it usually is. In July 2019, the Mekong reached its lowest point in a century in Northern Thailand and the fishing industry faced a crisis as the annual flooding cycle was disrupted. Also, the usually dark brown water of the river turned blue as the upstream rivers held back ever more sediment. Still, China also stores water in reservoirs during the wet season and then releases water during the dry season to power its hydroelectric turbines. Probably, Southeast Asia would have experienced a much less severe drought if it were not for China's dams. Even if this is not a climate change-related issue, the dams are causing significant economic damage as China deprived millions of people of their livelihood and damages the ecosystem of the river.

<sup>22</sup> Eyler B, "Science Shows Chinese Dams Are Devastating the Mekong" (*Foreign Policy* April 22, 2020) <https://foreignpolicy.com/2020/04/22/science-shows-chinese-dams-devastating-mekong-river/>.

<sup>23</sup> "China Held Water Back from Drought-Stricken Mekong Countries, Report Says" (*Mongabay Environmental News* April 30, 2020) <https://news.mongabay.com/2020/04/china-held-water-back-from-drought-stricken-mekong-countries-report-says/>.

Even though hydroelectric power accounts for about 70 percent of the world's renewable energy supply, it is widely criticized for its disappointing energy outputs, short lifespan, and negative impacts on the ecosystem.<sup>24</sup> Often, dams are intended to last only 30 years, and repairing them is three times as expensive than removing them. Removing a dam once it extended its useful life is extremely expensive.<sup>25</sup> It might be that if the cost of removal would be calculated into a new hydro development, many dams would not even be built. Climate change also greatly influences a dam's cost and productivity as construction and deforestation increase the amount of sediment deposited into a river by orders of magnitude, shortening the life of a dam or requiring expensive intervention measures. If we consider these costs and the loss of fisheries, we can see that there is a greater loss brought by the dams than the benefits coming from electricity generation, flood control, and improved irrigation.

### **3.2. Environmental Aspect**

There is a growing concern regarding the Mekong Delta as it is being hammered by climate change, dams, and inappropriate and unsustainable farming practices. An environmental disaster seems to be unavoidable as lowlands become fertile in Vietnam and Cambodia affecting 35 million people. Still, more dams are being built on the Mekong. Unfortunately, the social and environmental costs of hydroelectric mega-dams have been underestimated and are expected to grow as climate change escalates. The presence of dams on the river resulted in habitat degradation, harmed biodiversity, caused the migration of aquatic species and in general, negatively changed the river's ecology. The first lower Mekong dam Xayaburi started working last summer and has already stolen the nutrients needed for life.<sup>26</sup> The Mekong is usually brownish and is swollen with silt but it was reported that it became crystal clear in Thailand meaning the death of the ecosystem. There are hardly any fish to catch and they are getting smaller and smaller. Many fishers reported that they cannot even catch enough fish for their families to eat and are forced to buy on the market, losing their source of income.

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<sup>24</sup> "Mega-Dam Costs Outweigh Benefits, Global Building Spree Should End: Experts" (*Mongabay Environmental News* January 2, 2019) <https://news.mongabay.com/2018/11/mega-dam-costs-outweigh-benefits-global-building-spree-should-end-experts/>.

<sup>25</sup> "The Hidden Costs of Hydro: We Need to Reconsider World's Dam Plans" (*Mongabay Environmental News* March 9, 2019) <https://news.mongabay.com/2019/03/the-hidden-costs-of-hydro-we-need-to-reconsider-worlds-dam-plans/>.

<sup>26</sup> Beech H and Dean A, "Damming the Lower Mekong, Devastating the Ways and Means of Life" (*The New York Times* February 15, 2020) <https://www.nytimes.com/2020/02/15/world/asia/mekong-river-dams-thailand.html>.

Previously, the Vietnamese government publicly opposed the building of dams on the Mekong but at the end of 2019, they have changed sides.<sup>27</sup> Petrovietnam – a local oil company – announced that it would invest in a huge dam close to the World Heritage Site in Luang Prabang, Laos. This is quite jaw-dropping considering that Vietnam already suffers from the impact of upstream Mekong dams. Local environmentalists started to protest stating that if Vietnam participates in the construction of the Luang Prabang Dam, that means they are also contributing to the negative impact on the Mekong Delta.

These hydroelectric dams also exacerbate climate change as they release methane from decomposing vegetation in flooded forests. The disruption to fish migration and sediment flow has serious implications for fishermen and they barely receive any compensation, if they do at all. Another huge issue is that hydroelectric dams rely on the stored energy of the water held back by the reservoir and as these shrinks and dry up, so will the supply of electricity.

For decades, hydropower dams were considered to be zero greenhouse gas emitters but they turned out to be just the opposite.<sup>28</sup> They contribute 1.3 percent of human-made greenhouse gas emissions as they release carbon dioxide, methane, and nitrous oxide as well. Over a hundred years, methane's effect on global warming is more than 30 times, and nitrous oxide's effect is almost 300 times, greater than CO<sup>2</sup>. Considering this, future projects should consider an environmental assessment that includes potential greenhouse gas emissions, keeping in mind that emissions from the natural ecosystem must be taken into account.

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<sup>27</sup> Fawthrop T, "Did Vietnam Just Doom the Mekong?" (– *The Diplomat* November 28, 2019) <https://thediplomat.com/2019/11/did-vietnam-just-doom-the-mekong/>.

<sup>28</sup> "Counterintuitive: Global Hydropower Boom Will Add to Climate Change" (*Mongabay Environmental News* February 14, 2017) <https://news.mongabay.com/2017/02/counterintuitive-global-hydropower-boom-will-add-to-climate-change/>.



### 3.3. An Innovative Replacement of Hydropower Dams

However, there might be a solution to these problems as the first floating solar power generating system in Southeast Asia was deployed on a reservoir in Vietnam.<sup>29</sup> This project in Vietnam is called Da Mi and was financed by the Asian Development Bank and another is expected in Cambodia. There is a chance that such low-cost, easily scalable solar power generating technologies may destroy the economic case for additional hydroelectric power projects.

Figure 8: Floating Solar Panels on the Mekong

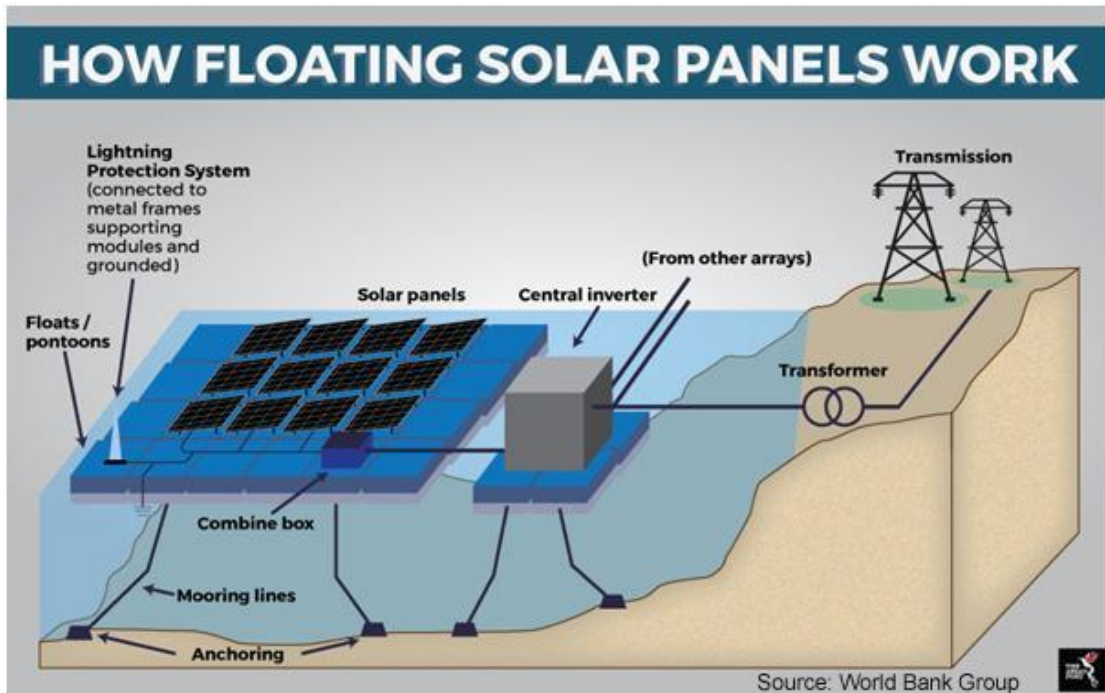


Source: <https://saigoneer.com/saigon-environment/17547-vietnam-receives-funding-from-adb-to-build-major-floating-solar-power-plant>

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<sup>29</sup> “Analysis: Floating Solar Power along the Dammed-up Mekong River” (*Mongabay Environmental News* January 9, 2020) <<https://news.mongabay.com/2019/12/analysis-floating-solar-power-along-the-dammed-up-mekong-delta/>> accessed May 24, 2020

Figure 9: The Mechanism of Floating Solar Panels



Source: <https://news.mongabay.com/2019/12/analysis-floating-solar-power-along-the-dammed-up-mekong-delta/>

Integrating a solar system with the already existing dam was compelling for the operators of Da Mi. It is a 50-hectare array of solar panels and each of them is tilted to a precisely calculated angle to maximize solar gain. Hydroelectric powerplant projects are now competitive with gas, coal, nuclear or hydropower. This is because utility-scale installations can be completed within a few months and the cost of solar photovoltaic panels has fallen sharply. The cost of battery storage and panel fabrication is expected to further reduce. There are no acquisition costs, transmission infrastructure is already in place and they are quite easy to scale up in case demand increases. Furthermore, power generation can be optimized by relying chiefly on photovoltaic power during daylight hours and on hydropower at night. It is no wonder that not only Vietnam but also the Philippines, Indonesia, Thailand, and Singapore are writing floating solar power systems into their master energy plans.

## 4. THAILAND

### 4.1. Economic Overview

Thailand is the world's 19th largest manufacturer and the second-largest economy in Southeast Asia.<sup>30</sup> In 2019, the Thai economy registered a 1.9% growth but its exports declined by 2.7% in the last quarter of the year. The government plans to set up a 20-year National Strategy Plan with the goal to achieve sustainability, prosperity, and security. In the future, the economic model called Thailand 4.0 will be most likely followed. This is to break the country free from the middle-income trap and unlock main economic challenges: environmental protection, economic prosperity, social well-being, and raising human values. The environmental protection part aims the provision of clean water and air and ensuring that all-natural assets can produce their full potential on a sustainable basis.

As of November 2019, Thailand's main export partners were the United States, China, Japan, Vietnam, and Hong Kong.<sup>31</sup> The main import partners were China, Japan, the United States, and Malaysia. As a result of the US-China trade war and COVID-19, the GDP is expected to decline in 2020.

Climate change is expected to have a serious social cost in Thailand. The World Health Organization estimated that heat waves will adversely affect outdoor workers, the elderly, and children.<sup>32</sup> Especially the increase of heat-related mortality among the elderly can be expected. The rising temperature could also spawn new harmful diseases so it would be crucial to building up a strong healthcare system.

Although I have sent some questions to the Embassy of Thailand in Hungary, instead they provided me some links which they consider essential on this topic. These were used in various parts of this paper.

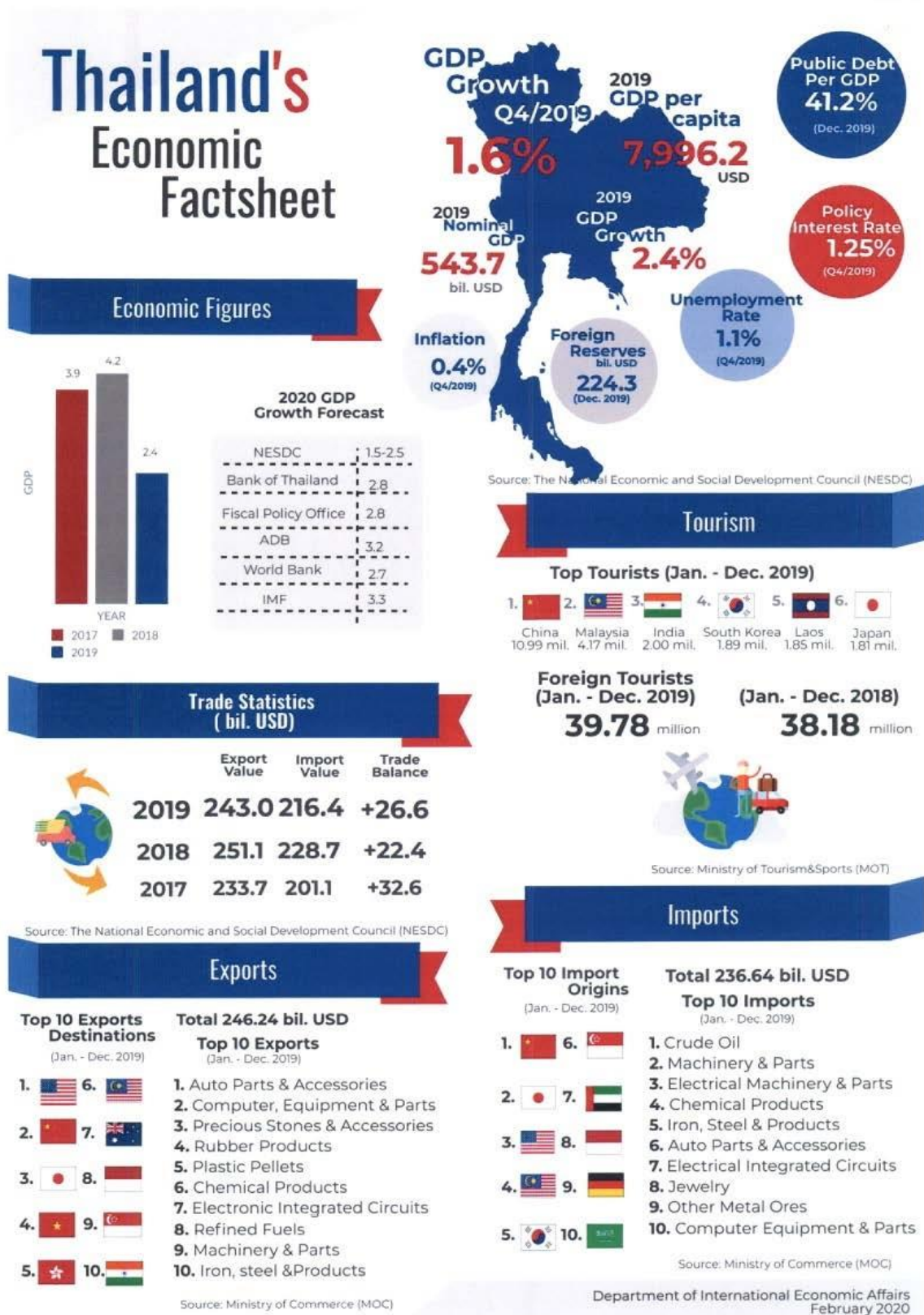
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<sup>30</sup>Thailandtoday.in.th. 2020. *Overview* / Thailandtoday. [online] Available at: <http://www.thailandtoday.in.th/economy/overview>.

<sup>31</sup>Nordeatrade.com. 2020. *Foreign Trade Figures Of Thailand - Economic And Political Overview - Nordea Trade Portal*. [online] Available at: <https://www.nordeatrade.com/fi/explore-new-market/thailand/trade-profile>.

<sup>32</sup>Banerjee, N., 2020. *The Cost Of Climate Change In Thailand - Climate Scorecard*. [online] Climate Scorecard. Available at: <https://www.climatescorecard.org/2019/10/the-cost-of-climate-change-in-thailand/>.

Figure 10: Thailand's Economic Factsheet



Source: <http://www.thailandtoday.in.th/economy/overview>

## **4.2. USAID Climate Change Risk Profile**

In 1995, Thailand graduated from USAID assistance and closed its bilateral mission the next year.<sup>33</sup> USAID returned to Bangkok to open a regional mission serving Asia. Currently, the organization works on cross border issues of concern to Thailand. The country is a member of the USAID-supported ASEAN Wildlife Enforcement Network which is raising awareness on the negative impacts of illegal wildlife trafficking. Other public-private partnerships work with local governments and luxury hotel chains to reduce the consumption of shark fin and stop the sale of shark products to preserve the marine ecosystem.

## **4.3. Increasing Tension**

Climate change does not only have a negative impact on agriculture and aquaculture but it also likely to create tension between Thailand and its neighboring countries over energy policy, refugee policy, and water management. Bangkok was ranked as the seventh most vulnerable port city in the world by the Organization for Economic Cooperation and Development (OECD). Even a small rise in sea level can hurt coastal tourism and the result is the destruction of mangroves and coral reefs. The Thai government is highly criticized as economic development is mostly concentrated only in Bangkok and touristic areas creating a huge socio-economic gap. This fuels tension between urban and rural dwellers. As Thailand receives less rain, the government faces a dual challenge of acquiring sufficient freshwater supplies and also distributing these evenly. Even tourist accommodations face this issue as there is no public water supply provision and they need to use underground water or harvest rain. Migration from rural areas to the capital is also on the increase. Due to climate change, average rice fields fell by 45% and farmers lost nearly half of their household income. This urged farmers to find other sources of income and many of them are moving to cities in the hope of job opportunities. Thailand tends to prioritize economic growth rather than environmental protection as the government is characterized by high levels of corruption. According to Richard Doner, there is a low level of institutional capacity to effectively address these issues and make commitments.

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<sup>33</sup> Usaid.gov. 2020. *Thailand Country Profile*. [online] Available at: <https://www.usaid.gov/documents/1861/thailand-country-profile>.

#### **4.4. Waste Management**

As over 35 million tourists visit Thailand every year, tourism is a driving sector of the economy but it puts significant pressure on the fragile ecosystem.<sup>34</sup> Tourism could be a positive driver with appropriate planning and management but local authorities cannot provide the necessary infrastructure and services. The ASEAN Tourism Strategic Plan 2016-2016 focuses on the sustainable development of tourism. In many of the touristic areas, land-use planning is not set up and waste management is a serious issue. Uncontrolled wastewater discharged from tourist accommodations causes water pollution due to the absence of a central wastewater treatment plan. Urbanization, population growth, and tourism led to a rapid increase of Municipal Solid Waste (MSW).<sup>35</sup> Issues related to MSW management such as recycling, waste reduction, and disposal – have not been addressed properly. Improper waste management causes air quality deterioration, greenhouse gas emissions, and groundwater contamination. The most widespread form of waste disposal is landfilling but the government made attempts to implement an integrated waste management system which includes sorting and composting as well. As of today, the country mainly relies on fossil fuels with oil and gas being dominant. We can expect that oil and gas will account for about 65% of total energy supplies by 2035 and renewable energy will still only contribute 19%.<sup>36</sup> A possible solution is biomass-based electricity production.

#### **4.5. Water scarcity**

Agriculture crucially depends on water quality and also quantity.<sup>37</sup> Therefore, the expansion possibilities of aquaculture rely on the growth of water demand. Currently, the biggest challenge for water management is the uncertainty around how water demand and availability will change in the future. The growing demand for the domestic and international consumption of farm fish results in a competition for water resources and could also lead to higher farm-gate prices. In aquaculture, floods can damage the cages, and droughts negatively modify water

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<sup>34</sup> Nitivattananon V and Srinonil S, “Enhancing Coastal Areas Governance for Sustainable Tourism in the Context of Urbanization and Climate Change in Eastern Thailand” (2019) 10 *Advances in Climate Change Research* 47-52.

<sup>35</sup> Udomsri S and others, “Clean Energy Conversion from Municipal Solid Waste and Climate Change Mitigation in Thailand: Waste Management and Thermodynamic Evaluation” (2011) 15 *Energy for Sustainable Development* 356.

<sup>36</sup> Chaiyapa W, Esteban M and Kameyama Y, “Sectoral Approaches Establishment for Climate Change Mitigation in Thailand Upstream Oil and Gas Industry” (2016) 94 *Energy Policy* p. 205.

<sup>37</sup> Louis Lebel, Pimphakan Lebel, Chanagun Chitmanat, Anuwat Uppanunчай & Chusit Apirumanekul (2018) *Managing the risks from the water-related impacts of extreme weather and uncertain climate change on inland aquaculture in Northern Thailand*, *Water International*, 43:2, 257-262, DOI: 10.1080/02508060.2017.1416446

flows, depth, and volumes. When reacting to imminent threats, farmers need to make key decisions taking market factors into account as well. They make adjustments to rearing practices and cropping calendars and often draw on groundwater or on-scale on-site water storage to deal with water shortages. They even need to move their cages to a protected location or harvest fish early. Of course, water scarcity also challenges the industrial and hydropower sectors. The research was conducted regarding the farmer's knowledge of climate change.<sup>38</sup> 80% of farmers experienced severe damage due to drought or flooding. It is quite odd that for some reason, farmers recognize drought more than flooding as climate change induces issue. Furthermore, even though they are aware that burning rice fields to prepare land causes greenhouse gas emissions, they cannot see any other way.

#### **4.6. The Impact of Climate Change on Development**

87% of Thailand's total area is prone to extreme heat, 39% is prone to droughts, 25% prone to landslides, and 7.5% prone to floods.<sup>39</sup> 47% of the land area is used for agricultural purposes and 60% of the agricultural land is prone to floods or drought. More than 10% of the Thai population lives on land that is likely to be inundated by 2050 and Bangkok is particularly at risk. Thailand's national strategy to reduce its GHG emissions by up to 25% by 2030 is underpinned by its aspiration to reach developed country status by 2036 as stated in the Thailand 4.0 economic model. The main issue is that this agenda requires a rise in energy demand by 78% by 2036. The challenge is not to have an increase in GHG emissions as GDP rises. This can be achieved by putting a price on carbon and passing the cost of emitting on to emitters and therefore incentivizing investment in renewable energy. This involves stopping subsidies for fossil fuels and stopping the building of new power plants based on coal in the future.

Agriculture is not the only sector that is negatively affected by climate change.<sup>40</sup> Thailand is already spending about 4.6% of its GDP on healthcare and according to the World Health Organization, 2.4 million Thai residents will be threatened by flooding from the sea. Water-borne diseases – such as dengue fever and malaria - are expected to be more common. The

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<sup>38</sup> Pichayanun Suwanmontri, Akihiko Kamoshita, Boonrat Jongdee, Shu Fukai & Hirohisa Kishino (2018) Comparative analysis of farmers engaged in participatory research to cope with climate change versus non-participants in Northeast Thailand, *Plant Production Science*, 21:4, 295-298, DOI: 10.1080/1343943X.2018.1498746

<sup>39</sup> 'Climate Change And What It Means For Thailand - Expat Life In Thailand' (*Expat Life in Thailand*, 2020) <https://expatlifeinthailand.com/green/climate-change-and-what-it-means-for-thailand/>.

<sup>40</sup> Project B, 'How Climate Change In Thailand Is Impacting Development' (The Borgen Project, 2020) <https://borgenproject.org/climate-change-in-thailand/>.

WHO predicts that 71 million people in Thailand will be at risk for malaria if current climate changes persist. Due to higher temperatures and floodings, malnutrition in the nation is also on the increase. Many experts say that the emphasis should not be on how to avoid the impact of climate-change-related events but rather on how to eliminate them.

#### **4.7. An Innovative Solution**

Worried about the fact that Bangkok might even be underwater by 2100, Harvard graduate architect Kotchakorn Voraakhom came up with an innovation that might be an effective way of climate change mitigation.<sup>41</sup> Along with her firm Landprocess, she created the Chulalongkorn University Centenary Park, an 11-acre (4 hectares) space in central Bangkok, which tilts downward at a three-degree angle, allowing rainwater to flow through the flanking grass and wetlands. If plants could not absorb the water, it runs down to a pond at the base of the park and can be stored and filtered and can be used in case of drought. If there is severe flooding, the park is capable to store up to a million gallons of water.

*Figure 11: Chulalongkorn University Centenary Park*



Source: <https://www.businessinsider.com/bangkok-park-holds-a-million-gallons-of-rainwater-to-prevent-flooding-2018-7>

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<sup>41</sup> The ASEAN Post. 2020. *Thailand's Secret Weapon In Climate Change Battle*. [online] Available at: <https://theaseanpost.com/article/thailands-secret-weapon-climate-change-battle>.

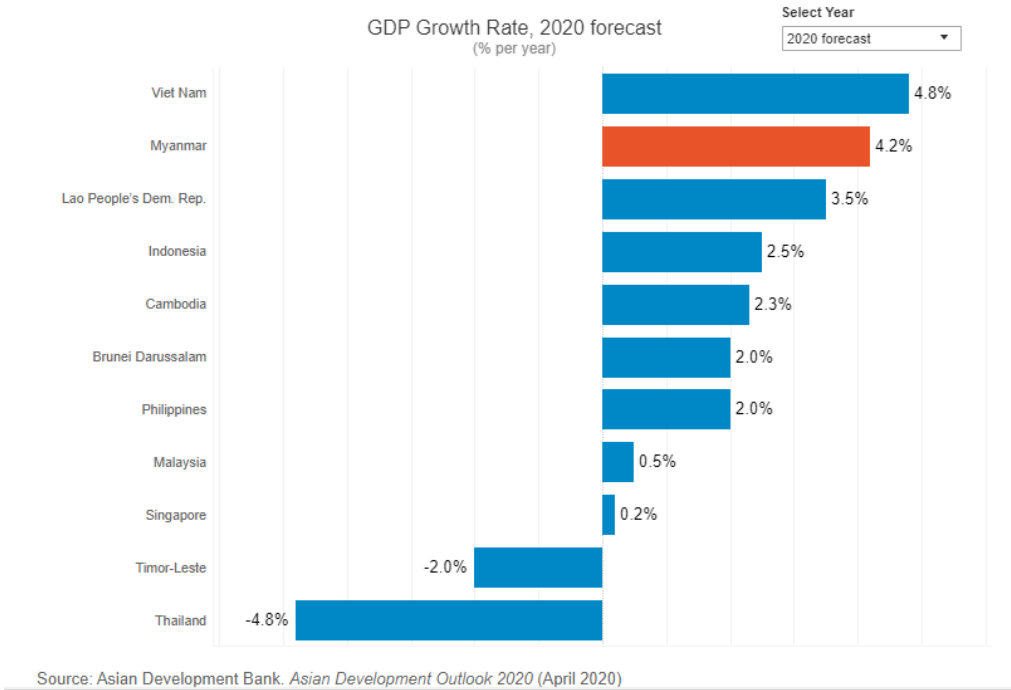


## 5. MYANMAR (BURMA)

### 5.1. Economic Overview

In 2011, Myanmar transitioned into a civilian government after 50 years of military rule. Myanmar held its first democratic elections in 2016 and since then the country is seeking to break with its past which was determined by economic mismanagement and internal conflicts.<sup>42</sup> The next presidential elections will be held this year in November and National League for Democracy (NLD) is expected to win.<sup>43</sup> As they started liberalizing the market and integrate into the region and modernizing economic and financial institutions, the economy has seen a rapid growth (over 7% annually) and poverty rates almost dropped to half. For 2021-2022, economic growth was projected to reach 6.7% but due to the outbreak of COVID-19, we can expect a decline to 2-4%.<sup>44</sup> However, in the below diagram we can see that only Vietnam is expected to have a higher rate of economic growth while Thailand can expect a significant decrease.

Figure 12: GDP Growth Rate 2020 Forecast



Source: <https://www.adb.org/countries/myanmar/economy>

<sup>42</sup> World Bank. 2020. *Overview*. [online] Available at <https://www.worldbank.org/en/country/myanmar/overview>.

<sup>43</sup> Solutions, E., 2020. *Myanmar Economy, Politics And GDP Growth Summary - The Economist Intelligence Unit* [online] Country.eiu.com. Available at: <https://country.eiu.com/myanmar>.

<sup>44</sup> Asian Development Bank. 2020. *Myanmar: Economy*. [online] Available at: <https://www.adb.org/countries/myanmar/economy>.

Table 1: Myanmar's Top 10 Export Products

1. Mineral fuels including oil: US\$3.5 billion (23% of total exports)
2. Clothing, accessories (not knit or crochet): \$3.1 billion (20.4%)
3. Knit or crochet clothing, accessories: \$1.4 billion (9.2%)
4. Ores, slag, ash: \$1 billion (6.5%)
5. Copper: \$811.5 million (5.3%)
6. Vegetables: \$470.9 million (3.1%)
7. Footwear: \$447.5 million (2.9%)
8. Gems, precious metals: \$441.4 million (2.9%)
9. Fish: \$375 million (2.4%)
10. Cereals: \$374.4 million (2.4%)

Source: <http://www.worldstopexports.com/myanmars-top-10-exports/>

Table 2: Myanmar's Top 10 Import Products

1. Mineral fuels including oil: US\$3 billion (12.5% of total imports)
2. Electrical machinery, equipment: \$2.6 billion (10.7%)
3. Machinery including computers: \$2.3 billion (9.5%)
4. Vehicles: \$1.5 billion (6.2%)
5. Iron, steel: \$1.2 billion (4.9%)
6. Plastics, plastic articles: \$857.1 million (3.5%)
7. Articles of iron or steel: \$675 million (2.8%)
8. Animal/vegetable fats, oils, waxes: \$625.2 million (2.6%)
9. Manmade filaments: \$583 million (2.4%)
10. Knit or crochet fabric: \$551.4 million (2.3%)

Source: <http://www.worldstopexports.com/myanmars-top-10-imports/>

Myanmar's top trading partners are China, Singapore, Thailand, and Japan. The top export products are clothing, vegetables, copper, footwear, fish, and cereals.<sup>45</sup> Among the main import products are mineral fuels, electrical machinery, computers and knit or crochet fabric.<sup>46</sup>

<sup>45</sup>Workman, D., 2020. *Myanmar's Top 10 Exports*. [online] World's Top Exports. Available at: <http://www.worldstopexports.com/myanmars-top-10-exports/>.

<sup>46</sup>Workman, D., 2020. *Myanmar's Top 10 Imports*. [online] World's Top Exports. Available at: <http://www.worldstopexports.com/myanmars-top-10-imports/>.

## 5.2. USAID Climate Change Risk Profile<sup>47</sup>

According to the 2020 Global Climate Risk Index, Myanmar is the 19th most-affected country of 191 in the world.

The frequency and severity of extreme weather events keep increasing and due to high levels of poverty the country has a low capacity to respond to natural hazards. This could undermine the country's economic progress and development efforts.

One of the biggest climate-related risks is sea-level rise. If there was a half-meter sea level rise, the Ayeyarwady Delta which is the country's main rice producer would recede by 10 kilometers. Another issue is that Burma's freshwater resources are not only unevenly distributed but also access. In the Ayeyarwady Delta, for instance, residents rely on communal ponds and tubes and open wells for water. These can easily be damaged or contaminated by tidal surges and result in diseases (cholera, malaria, yellow fever). Fisheries are also endangered which poses a serious threat to the economy as they contribute 10% to the GDP.

## 5.3. Factsheet from the Embassy of the Republic of the Union of Myanmar

I have contacted the Embassy of the Republic of the Union of Myanmar in the Republic of Serbia as Myanmar does not have an embassy in Hungary. Even though they did not specifically answer my questions, they shared the following facts:

- *Myanmar's location and physical diversity mean climate change takes many forms- in the dry zone, temperatures are increasing and droughts are becoming more prevalent, while the coastal zone remains at constant risk of intensifying cyclones. Myanmar is extremely vulnerable to the impacts of climate change, due to its exposure and sensitivity to projected weather and climate patterns. Observed evidence of climate change in Myanmar is droughts, heavy rain, cyclones, and extreme temperatures. In the last six decades, Myanmar has recorded the increased intensity of floods, cyclones, and droughts which have caused the loss of lives and suffering, damages to infrastructure and assets, and economic impacts. The impacts of climate change are likely continuing to impact Myanmar's Society and Economy due to heavy*

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<sup>47</sup> Climatelinks.org. 2020. [online] Available at: <https://www.climatelinks.org/sites/default/files/asset/document/2017%20CRM%20Fact%20Sheet%20-%20Burma.pdf>

*dependency on climate-sensitive sectors for livelihoods. Also, millions of people are concentrated in regions naturally exposed to the severe climatic event. Recognizing these circumstances, Myanmar adopted National Environmental Policy and Climate Change Policy.*

- *Myanmar is also a member of the EITI (Extractive Industries Transparency Initiative) and joined since 2014.*
- *Myanmar founded Independent Burma Meteorological Department in 1937. At present, the department renamed as Department of Meteorology and Hydrology (DMH) and operating its function regarding climate change, meteorology, hydrology under the administration of the Ministry of Transport, and Communication of Myanmar.*
- *Also, Myanmar founded the Environmental Conservation Department in 2012, which is currently operating its functions under the administration of the Ministry of Natural Resources and Environmental Conservation of Myanmar.*
- *In the Economy sector, Myanmar's potential regard to trade and investment is enormous.*
- *In the Energy sector, Myanmar had Energy Strategy to introduce 100 % Electrification in 2030. Nearly 70 % of Myanmar Electricity is produced by Hydropower.*

## **5.4. Agriculture**

Farmers are under pressure to produce more food on less land, water, and labor to meet the growing demand of the population.<sup>48</sup> Rice farmers usually have low levels of household food and nutrition security so it is incredibly challenging for them to meet these expectations. In Myanmar, rice is grown on 7.28 million ha occupying two-thirds of the agricultural land. 24% of the national rice area is located in the Ayeyarwady delta and 22% is in the dry zone. In the dry zone, many farmers do not have access to irrigation water so they only produce rice in the wet season. In the delta, rice production is affected by salinity in the dry season and flood in the wet season. This variability requires crop management that adapts to each location. Unfortunately, the most productive rain-fed farming areas are threatened by salt intrusion and

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<sup>48</sup> Radanielson A and others, "Targeting Management Practices for Rice Yield Gains in Stress-Prone Environments of Myanmar" (2019) 244 Field Crops Research 107631. p.2.

rising sea levels.<sup>49</sup> Moreover, the delta region is not protected against periodic saltwater intrusion.

### **5.5.Reframing Hydropower Dams**

Mega development projects can be really good from an economic point of view for industrial and commercial purposes.<sup>50</sup> On the other hand, they are often relabelled as climate change mitigation or adaptation initiatives. This is mostly done by governments who use this tactic against those who resist or protest against such projects. Hydropower dams are a good example of that as they have been one of the most controversial and resisted state-sponsored mega projects for decades. Many dam projects were withdrawn because of protests but nowadays they are usually framed as climate change mitigation projects. In 2008, the Myanmar Government was planning to build such a dam on the Salween River to generate cheaper electricity. However, due to protests by residents, the government was forced to suspend the project. After a few years in 2015-2015, the government made hints about the possible relocation of the affected people and villagers became suspicious that the project was still on the table. According to villagers, the government justified the hydropower project by stating that it serves the protection of the environment. Officials tried to convince people that building the dam is important because of climate change and everyone would have access to cheap electricity. Thus, they can stop using charcoal for cooking and they were advised to stop cutting trees for firewood. This way charcoal production would come to its end and deforestation would be significantly reduced. The government said that villagers need to support the dam as it serves the environment. These framings by the government became more and more common over the years. What they neglect is that these areas are people's homes and residents rely on the Salween Water for their water needs, including drinking water. Many households in the Salween Water area are engaged in rubber cultivation. Previously, the area was used for poppy cultivation but it was stopped in 2002. Then new crops such as sugarcane, crops, and rubber were introduced. Villagers complain that the military and entrepreneurs took a significant part of their lands for various reasons. In 2015, the government officially announced that the dam would be built and

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<sup>49</sup> Oo AT, Huylenbroeck GV and Speelman S, "Assessment of Climate Change Vulnerability of Farm Households in Pyapon District, a Delta Region in Myanmar" (2018) 28 International Journal of Disaster Risk Reduction 10-21. p.10.

<sup>50</sup> Borrás SM, Franco JC and Nam Z, "Climate Change and Land: Insights from Myanmar" (2020) 129 World Development 104864. p.4- 8.

the villagers need to move and they were offered some compensation. Civilians, churches, NGOs, and other organizations launched a protest against the hydropower plant along the Salween River. It turned out that more than 20 hydropower projects were being planned. In 2016, the government suspended the construction of the dam again. However, in 2017, they launched the Myanmar Climate Change Strategy and Action Plan 2016-2030. This focuses on forest conservation and renewable energy mainly in the form of hydropower megaprojects.

## **5.6. Adaptation Measures**

President U Win Myint has The Myanmar Sustainable Development Plan (2018-2030) which is committed to a climate-sensitive development pathway and is complemented by the new National Environmental Policy and Myanmar Climate Change Policy.<sup>51</sup> These plans also serve as a basis for Myanmar's implementation of the Paris Agreement. To reduce GHG emissions, the Government aims to reverse the decline of the forests and has committed US\$500 million over 10 years for the Myanmar Rehabilitation and Reforestation Programme. By 2030, renewable energy is supposed to contribute 90% of the country's energy mix. As the protection of forests is a crucial part of the environmental policy, over 5 million households received fuel-efficient cooking stoves. This not only avoids people from gathering firewood but also contributes to health improvement.

The United Nations Development Programme initiated a project which seeks to reduce the vulnerability of farmers in Myanmar's Dry Zone to increasing drought and rainfall variability, as well as enhance their capacity to plan for and respond to future climate change impacts on food security. The Dry Zone is the home to about 18 million people and is the most food-insecure part of the country. This project operates in five townships: Myingyan and Nyaung Oo in the Mandalay region, Shwebo and Moneywa in the Sagaing region, and Chauk in the Magway region. About 42,000 households from 280 villages are supposed to directly benefit from these projects. Among the key goals are expanded agro-forestry services; improved water supply on drought-prone fields; access to diversified and improved crops for fields and home gardens; diversified livestock rearing; and arrested soil erosion and watershed protection.

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<sup>51</sup> 'Climate Change Matters To Myanmar' (*The Myanmar Times*, 2020) <https://www.mmmtimes.com/news/climate-change-matters-myanmar.html>.

Landless people should have better opportunities for manual work in agro-, agroforestry, and water-related components of the project.<sup>52</sup>

Figure 13: Damage caused by Cyclone Nargis in 2008



Source: <https://burmacampaign.org.uk/gallery/cyclone-nargis/>

On September 9, 2019, UNDP held a seminar for MPs in Naypyitaw to discuss the risks of climate change.<sup>53</sup> The seminar took place because over 100,000 people had to be evacuated during the monsoon season due to flooding and landslides caused by torrential rain, taking 70 lives. According to historian U Thant Myint-U, “*the impact of climate change on Myanmar will be nothing less than catastrophic.*” Dr. Thant fears that Burma is dangerously unprepared to

deal with the impacts of climate change, citing the country’s poverty and weak state institutions. He believes that even a slightly richer country could better cope with the consequences like Thailand but Myanmar experiences as devastating catastrophes as Cyclone Nargis which killed 140,000 people overnight in 2008. Participants discussed what actions Myanmar could take to prevent the worst consequences of climate change and adapt to its effects. The country is dedicated to protect its existing forests and biodiversity and invest in clean low-carbon electricity generation. In November 2020, the United Nations is supposed to host a major climate change summit known as COP26. This will be the most important gathering on climate change since the ratification of the Paris Agreement in 2015. The summit will review the Nationally Determined Contributions (NDCs) to limit or reduce emissions that individual governments were required to submit.

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<sup>52</sup> 'Addressing Climate Change Risks On Water Resources And Food Security In The Dry Zone Of Myanmar | UNDP Climate Change Adaptation' (*Adaptation-undp.org*, 2020) <https://www.adaptation-undp.org/projects/af-myanmar>.

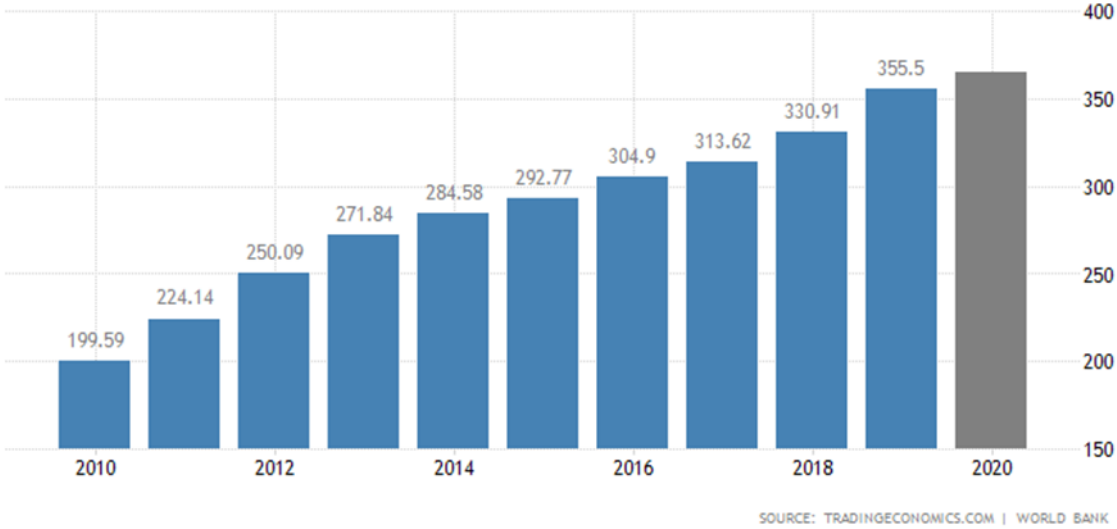
<sup>53</sup> 'Myanmar At Risk From Worsening Climate Crisis - Myanmar' (*ReliefWeb*, 2020) <https://reliefweb.int/report/myanmar/myanmar-risk-worsening-climate-crisis>.

## 6. REPUBLIC OF THE PHILIPPINES

### 6.1. Economic Overview

The Philippines has 108.3 million residents. According to official data from the World Bank, the Gross Domestic Product was worth 355.50 billion US dollars in 2019 in the Philippines.<sup>54</sup> This represents 0.29 percent of the world economy GDP.

Figure 14: GDP of the Philippines Between 2010 and 2020



Source: <https://tradingeconomics.com/philippines/gdp>

In the same year, the export was about US\$ 70.3 billion worth of products which reflects a 19.9% acceleration since 2015.<sup>55</sup> There was a 4.2% increase from 2018 to 2019. By value, 67.7% of exports were delivered to Asian countries, 18.1 % were sold to North America and 12.5% worth of goods were shipped to Europe. Compared to the previous year, among the fastest-growing trading partners were Vietnam (up 33.5%), South Korea (up 26.2%), and Japan with a rise of 12.2%. Interestingly, South Korea significantly reduced its import from the Philippines, by 28.6% to be precise. The country ended in 2019 with a US\$ 42.6 billion trade deficit, incurring the highest trade deficit from China (US\$ -16.1 billion).

<sup>54</sup>Tradingeconomics.com. 2020. *Philippines - Economic Indicators*. [online] Available at: <https://tradingeconomics.com/philippines/indicators>.

<sup>55</sup>Workman, D., 2020. *Philippines Top Trading Partners*. [online] World's Top Exports. Available at: <http://www.worldstopexports.com/philippines-top-import-partners/>.



The below table represents the top 15 trading partners of the Philippines' that imported the most products by value:

*Table 3: Top 15 Trading Partners of the Philippines*

1. United States: US\$11.5 billion (16.3% of total Filipino exports)
2. Japan: \$10.6 billion (15.1%)
3. China: \$9.6 billion (13.7%)
4. Hong Kong: \$9.6 billion (13.7%)
5. Singapore: \$3.8 billion (5.4%)
6. South Korea: \$3.2 billion (4.6%)
7. Thailand: \$3 billion (4.2%)
8. Germany: \$2.7 billion (3.9%)
9. Netherlands: \$2.3 billion (3.2%)
10. Taiwan: \$2.2 billion (3.2%)
11. Malaysia: \$1.8 billion (2.6%)
12. Vietnam: \$1.3 billion (1.8%)
13. Indonesia: \$821.6 million (1.2%)
14. France: \$798.3 million (1.1%)
15. Mexico: \$670.8 million (1%)

Source: <http://www.worldstopexports.com/philippines-top-import-partners/>

*Table 4: Top 10 Exports of the Philippines*

RANK	PHILIPPINES' EXPORT PRODUCT	2019 VALUE (US\$)	CHANGE
1	Integrated circuits/microassemblies	\$18,991,451,000	+38.5%
2	Computers, optical readers	\$4,687,863,000	+7.1%
3	Electrical machinery	\$2,841,997,000	-57%
4	Insulated wire/cable	\$2,570,169,000	+31.9%
5	Printing machinery	\$2,137,012,000	+6.1%
6	Electrical converters/power units	\$1,992,083,000	-4.3%
7	Bananas, plantains	\$1,930,879,000	+28.3%
8	Computer parts, accessories	\$1,478,448,000	+9.6%
9	Solar power diodes/semi-conductors	\$1,470,013,000	-50.3%
10	Gold (unwrought)	\$1,374,438,000	+20.9%

Source: <http://www.worldstopexports.com/philippines-top-10-exports/>

Table 4 shows the top 10 export products of the country with the main ones being integrated circuits computers and electrical machinery.

Table 5: Top 10 Import Products of the Philippines

1. Electrical machinery, equipment: US\$27 billion (23.9% of total imports)
2. Mineral fuels including oil: \$13.6 billion (12%)
3. Machinery including computers: \$12.5 billion (11.1%)
4. Vehicles: \$8.5 billion (7.5%)
5. Iron, steel: \$3.9 billion (3.5%)
6. Plastics, plastic articles: \$3.7 billion (3.3%)
7. Cereals: \$2.9 billion (2.6%)
8. Aircraft, spacecraft: \$2.8 billion (2.5%)
9. Optical, technical, medical apparatus: \$2.4 billion (2.1%)
10. Articles of iron or steel: \$1.9 billion (1.7%)

Source: <http://www.worldstopexports.com/philippines-top-10-imports/>

As we can see in Table 5, the top import products of the Philippines are electrical machinery, mineral fuels, and machinery.

6.2. USAID Climate Change Risk Profile<sup>56</sup>

Figure 15: Climate Risk Profile of the Philippines



Source: [https://www.climatelinks.org/sites/default/files/asset/document/2017\\_Climate%20Change%20Risk%20Profile\\_Philippines.pdf](https://www.climatelinks.org/sites/default/files/asset/document/2017_Climate%20Change%20Risk%20Profile_Philippines.pdf)

According to the USAID climate change risk profile, the country is highly vulnerable to the impacts of global warming. It consists of 7,107 islands divided into three island groups (Luzon, Visayas, and Mindanao) and sea levels are rising faster than the global average. The main economic sectors are services (55%), agriculture (29%), and industry (16%). As per projections, there will be a 1.8-2.2 C rise in temperature by 2050, and by 2100 sea level can even increase by 0.48-0.65 meter.

<sup>56</sup>Climatelinks.org. 2020. [online] Available at: [https://www.climatelinks.org/sites/default/files/asset/document/2017\\_Climate%20Change%20Risk%20Profile\\_Philippines.pdf](https://www.climatelinks.org/sites/default/files/asset/document/2017_Climate%20Change%20Risk%20Profile_Philippines.pdf).

The main consequences are:

- **Agriculture:** crop loss/failure; rising food prices
- **Water:** water shortages, degraded water quality
- **Energy:** increased demand for energy services <-> reduced energy production potential
- **Coastal Ecosystems:** reduced fish populations, loss of coastal defense and biodiversity
- **Infrastructure:** damage to water and sanitation facilities, roads and bridges
- **Human Health:** Increased risk of diseases, loss of life and livelihood, relocations

Agriculture contributes 12% to GDP. From 2006-2013, the country was struck by 73 disasters causing US\$3.8 billion loss to the sector. Rice, wheat, and corn yields may decline by 10% for every 1°C rise over 30°C.

The lead policy-making body on climate change concerns is The Climate Change Commission (CCC), established by the Republic Act 9729 and the Philippine Climate Change Act of 2009. The CCC is responsible for coordinating, monitoring, and evaluating actions and they developed the National Framework Strategy on Climate Change (NFSCC) in 2010.

Figure 16: Climate Stressors in Agriculture

Climate Stressors and Climate Risks AGRICULTURE	
Stressors	Risks
Increased temperatures	Increased heat stress and reduced yields
	Increased pest infestations
	Increased frequency of crop and/or productivity loss from floods and droughts
Increased rainfall variability	Failure of rainfed crops and increased need for irrigation
Increased frequency of extreme weather events	Higher food prices and increased demand for imports
	Reduced soil and crop productivity through nutrient leaching, erosion and runoff
Sea level rise	Loss of arable land and irrigation water to salinity

Source: [https://www.climatelinks.org/sites/default/files/asset/document/2017\\_Climate%20Change%20Risk%20Profile\\_Philippines.pdf](https://www.climatelinks.org/sites/default/files/asset/document/2017_Climate%20Change%20Risk%20Profile_Philippines.pdf)

### 6.3. Discussion with Peter Klemensits

As part of my research, I had the chance to briefly talk to Péter Klemensits who is an acknowledged researcher in Southeast Asia and a member of the Pallas Athene Geopolitical Institution. His main field of research is history and international relations. He published several articles studies and is a regular participant in international conferences. As he was short on time, he advised discussing the main points from his article which was published last year with the title: *Economic Development or Environmental Protection? The Dilemmas of the Developing*

*Countries through the Case of the Philippines.*<sup>57</sup> He highlighted that sometimes governments need to choose between economic development and environment protection causing a serious conflict of interest. He believes that the Philippines is a fine example of this as under the presidency of Rodrigo Duterte the government is struggling to find a balance. The government made serious efforts towards the preservation of the environment but at the same time, they also prioritize economic development. The Philippines has the 34th largest economy in the world and in 2017 they have seen a GDP growth of 6.7%. Mr. Klemensits stressed that this economic development resulted in serious environmental damage which cannot be ignored. River Manila is among the 10 most polluted rivers in the world as the country lacks industrial sewage cleaning. As a result, 75% of the Philippine's river-waters are contaminated. Landslides are getting more common as due to deforestation, the forest cover of the country decreased to 20% from 70%. Industrialization also brought about a high level of air pollution, causing every fourth person's death. Air-, water- and soil pollution were caused by mining, coal-fired power stations, and illegal deforestation. After President Duterte was elected, he promised to supervise mining permits, fight illegal fishing and wood-cutting. He also aimed to prohibit the establishment of new mines and head towards renewable energy resources. His economic policy is called the DuterteNomics and included the improvement of rural areas, general access to healthcare and education, tax reform, promoting investments, and increasing competitiveness. His key strategy is infrastructure investment which can decrease economic poverty and promotes economic growth. The main perspective of the Philippine Development Plan (PDP) 2017-2022 is to reduce poverty to 14% and maintain an ecological balance. In 2016, Regina Lopez was appointed as head of the Philippine Department of Environment and Natural Resources. She gained a reputation as a hard-core environmentalist and she ordered the supervision of all mining activities. Eventually, 23 mining operations were shut down, 5 contracts were suspended and 75 mineral production sharing agreements were terminated. However, Duterte wanted a compromise between the mining groups and the environmentalists. Finally, the moratorium lifted the exploration permits for mineral and economic interests have gained a victory over environmental considerations. Still, Duterte aims to find a balance, and the National Greening Program represents this. Between 2017 and 2022, the Government wants to plant a forest on 1.2 million hectares. Also, like other leaders of the region, he was reserved

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<sup>57</sup> Klemensits P, "Economic Development or Environmental Protection? The Dilemmas of the Developing Countries through the Case of the Philippines" (2019) 8 European Journal of Sustainable Development 281-289.

regarding the Paris Climate Treaty as he blamed Western countries responsible for climate change, but signed it in 2017. Duterte also ordered the closure of a tourism paradise in Borocay in 2018 to protect the environment and received criticisms for the loss of income this caused to the country.

#### **6.4. The Cost of Extreme Weather Events**

Extreme weather events ranging from monsoon rains and tropical cyclones to dry spells have turned into disasters in the Philippines and have had a tremendous impact on the economy. The Philippines are highly vulnerable to the threats posed by natural hazards as it is an island state, an archipelago, and a developing country. Research studies extreme weather events and related disasters that occurred between 2004 and 2008 in the Philippines.<sup>58</sup> Being located in the Pacific Ring of Fire, it is characterized by volcanic arc systems and present-day geothermal systems. Also as it is in the tropics, the combination of sun, water, and wind created thick soil covers. Depending on several factors (alteration of form soil, plants, and organic materials in the soil, the steepness of slope, participation, minerals, etc.) these thick soil covers can easily generate landslides or earthquakes. The Philippine Area of Responsibility (PAR) experiences about 20 tropical cyclones annually and ca. 7-8 of these turn into landfalls. Normally most of the tropical cyclones are formed in the Philippine Sea but in recent decades they have also been forming in the South China Sea. The Inter-Tropical Convergence Zone (ITCZ) – which is another source of rain - is the convergence of the northern and southern hemisphere trade winds. Moreover, the country is also affected by the El Nino Southern Oscillation. As previously mentioned, the article concentrates on disasters that occurred between 2004 and 2008 and this data can serve as an indicator for future events as well. The most important natural disasters and their consequence related to the national budget were the following:

- **2004:** 25 tropical cyclones; landslides caused the artificial damming of the Agos River system leading to its breach led to serious floods resulting in a massive loss of life and property. → **damage: USD 232 million**
- **2005:** “Only” 17 tropical cyclones, relatively quiet period with no considerable damage
- **2006:** Guinsaugon in Southern Leyte suffered a major disaster affecting about 1,000 people. There was too much rain in February (787 millimeters compared to the monthly average of 290 millimeters. This led to a landfall burying the entire village. In addition,

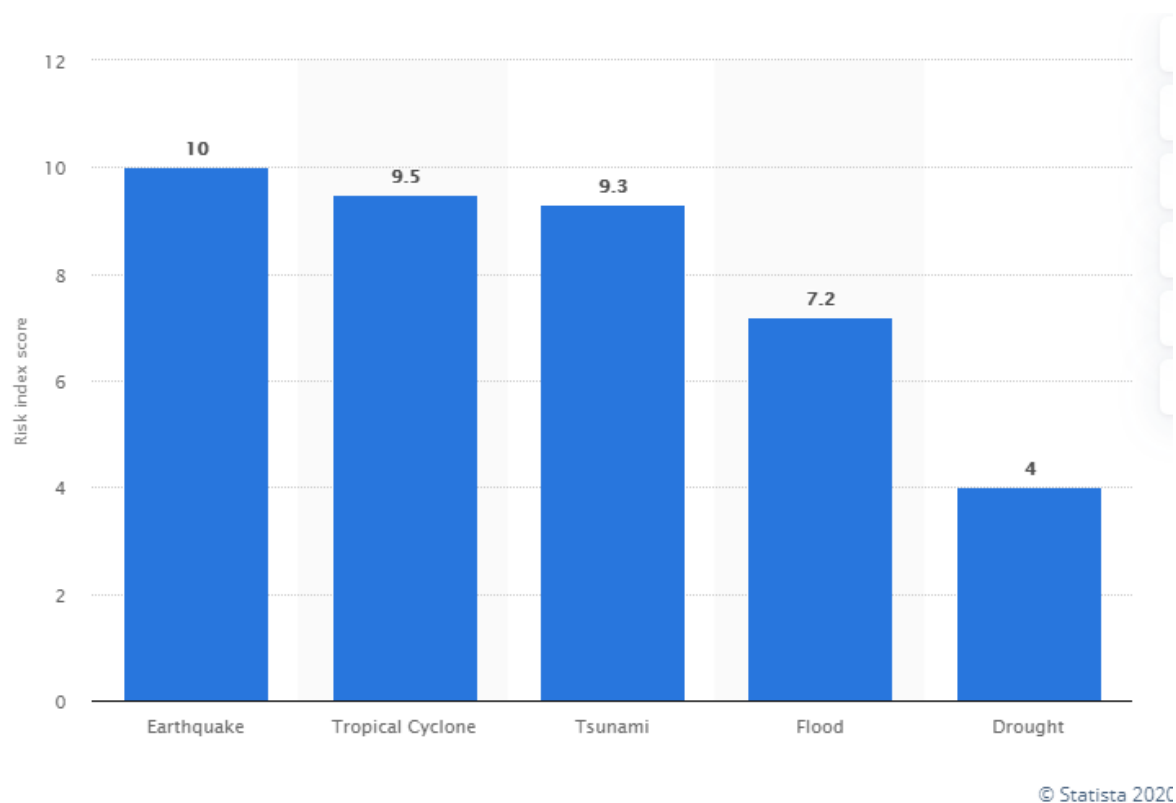
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<sup>58</sup> Yumul, G., Cruz, N., Servando, N. and Dimalanta, C., 2020. *Extreme Weather Events And Related Disasters In The Philippines, 2004-08: A Sign Of What Climate Change Will Mean?*. 363-374.

the southwest monsoon also arrived late and during the El Nino phase of the ENSO leading to three super-typhoons making landfall (Cimarron, Chebi, and Durian). If this would not be enough, Typhoon Xangsane hit directly Manila and took 197 lives. → **damage: USD 389 million.**

- **2007:** A dry La Nina event left Luzon with a deficient supply of rain, no major catastrophe occurred.
- **2008:** Exceptional wet spell, floods, and landslides characterized the year. Three tropical cyclones formed in the South China Sea which is quite rare and two of these caused significant destruction in Mindanao. Mountainous areas in Luzon had cooler temperatures than usual causing damage in the vegetable industry. → **damage: USD 404 million.**

Figure 17: Natural Disasters by Type in the Philippines



Source: <https://www.statista.com/statistics/921036/philippines-risk-index-for-natural-disasters/>

What is quite surprising in the case of the Philippines is that the El Nino events are generally wet in South America but here they are dry and the reverse applies to La Nina events which result in floods. There are many initiatives in the Philippines to handle proactively natural disasters. Among these are community-based early warning systems, improved land-use planning, public-private partnerships through housing projects, and livelihood programs. In

many cases, extreme weather conditions have triggered several events such as the sinking of water transport vessels (leading to an oil-spill and long-term ecological imbalance), grounding of transport facilities, and the flooding of underground mining tunnels. Excessive flooding led to destruction of riverbank communities, fishponds, and agricultural lands. As a consequence of extreme weather-induced events, the country needed to reallocate its financial resources for rescuing and rehabilitating affected areas. Each year about 0.5 percent of the Philippines' GDP was lost to disasters and this money was mainly taken from a budget that was meant to cover basic social services and developmental initiatives.

## **6.5. Agriculture**

In Ifugao, Batad Rice Terraces are declared as Globally Important Agricultural Heritage System and are inscribed as a World Heritage Site by UNESCO.<sup>59</sup> These are because the Terraces are considered as a living sustainable agricultural system and it is a traditional system with the goal of biodiversity conservation. The Ifugao Rice Terraces are located on a hand-carved landscape by the ancestors of Ifugao people from more than 2,000 years ago. The construction of the terraces and the traditional skills of engineering distinguished it from other rice terraces. Unfortunately, the Batad Rice Terraces are also in danger as they are highly exposed to disasters. Ifugao ranks third among provinces at risk of typhoons. In 2010, the province experienced extreme drought which resulted in a decreased volume of water in all resources; irrigation canals, rice fields, and farmlands dried up; livestock starved and there were forest fires as well.

Besides rice, corn is considered to be the second most important crop in the Philippines and it is the main source of income for about 24 million families.<sup>60</sup> In 2014, about 26 million hectares of land were planted with corn-producing 7.7 million tons of corn with an estimated value of USD 867 million. While white corn serves as a substitute for rice, yellow corn is mostly used in the animal feed industry. Unfortunately, changes in climate might make the area unsuitable for crop production in the future as changes in temperature and rainfall negatively affect crop growth and development. Almost 90% of the country is projected to experience an increase in

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<sup>59</sup> Ducusin, R., Espaldon, M., Rebancos, C. and De Guzman, L., 2019. Vulnerability assessment of climate change impacts on a Globally Important Agricultural Heritage System (GIAHS) in the Philippines: the case of Batad Rice Terraces, Banaue, Ifugao, Philippines. *Climatic Change*, 153(3), pp.395-413.

<sup>60</sup> Salvacion A.R., 2017. Mapping spatio-temporal changes in climatic suitability of corn in the Philippines under future climate condition. *Quaestiones Geographicae* 36(1), Bogucki Wydawnictwo Naukowe, Poznań, pp. 105–106, 11 figs, 5 tables.

rainfall and temperature is expected to increase in the whole country. This may lead to suitability to produce corn from high to marginal.

## 6.6. Community responses

The Filipinos have quite a unique and strong sense of togetherness when natural disasters strike.<sup>61</sup> Community-led responses are common, mostly led by the Homeless People's Federation of the Philippines Incorporated (HPFPI) which is a national network of 161 urban poor community associations and saving groups spanning the major regions of the country. In 2007, they had about 70,000 members and they aim to secure decent living and economic conditions, emancipation from poverty, protection of human rights: Members promote community savings to secure their financial capacities, negotiate for state resources and achieve community development and special cohesion. Their focus is on mobilizing low-income communities residing in areas at high risk from natural disasters. Thus, they take part in resettlement and post-relocation activities. One of their biggest stories is related to Typhoon Reming from late 2006. At the end of November, Typhoon Reming triggered floods and mudslides with more than 225 kilometers per hour. About 208 people died and another 261 went missing. 6 days later HPFPI leaders visited the site and decided to focus on reconstruction efforts. By September 2008, local savings organizations had 1,147 members and savings ca. US\$18,000 and they managed to acquire suitable land for resettling for about 343 families. It must be noted that these are low-income families so achieving any development aspirations individually is almost impossible. Collective action can not only reduce the risks associated with poverty but can also help build effective development strategies.

An interesting cultural aspect is the Palawan island where the indigenous Pala'wan share the belief that the variation in rainfall and related food insecurity is the result of a linear change in climatic patterns rather than caused by the cyclical El Nino Southern Oscillation.<sup>62</sup> Moreover, they are convinced that climate change is just divine punishment for the so-called *sumbang* or in other words incestuous relationship. As the variability in monsoonal rainfall is strongly associated with the moral decline among these people, they regularly practiced executions until the government prohibited them from the 1950-60s. Of course, the level of punishment depended on the severity of the crime committed. In case of an abundance of rain, for instance,

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<sup>61</sup> Dodman, D., Mitlin, D. and Co, J., 2010. Victims to victors, disasters to opportunities: Community-driven responses to climate change in the Philippines. *International Development Planning Review*, 32(1), pp.1-12.

<sup>62</sup> Smith, W., 2018. Weather from incest: The politics of indigenous climate change knowledge on Palawan Island, the Philippines. *The Australian Journal of Anthropology*, 29. kötet, p. 265–274.



offenders were beheaded and the bodies were left to dry. If there was an excessive drought, the beheaded bodies were soaked in a river to bloat. After the ritual ended, the bodies were thrown into the ocean. In other cases, offenders were simply tied into a large basket of rocks and thrown into the ocean. Since the government forbade the execution of incestuous couples, the Pala'wan carries out these punishments in a less lethal fashion without violating state law. Nowadays, blood is ceremonially drawn from the offender's thighs or upper arms which is collected in a plate and thrown into the ocean. The main problem with the Pala'wan ensuring proper environmental functions be deterring immorality – other than violating basic human rights – is that they challenge global environmental policy where indigenous people often play a key role because of their detailed knowledge of local ecosystems and biophysical processes. Instead of accepting scientific data, they simply ignore the possible solutions to deal with the negative impacts of climate change.

### **6.7. Raising Awareness**

Considering how vulnerable the Philippines to climate change is, it is no wonder that the government actively promotes climate change mitigation programs through the Climate Change Office of the Department of Environmental and Natural Resources (DENR).<sup>63</sup> They highlight the importance of environmental issues, making part of the national school curriculum. According to the Philippine Department of Education (2013) curriculum guide, students are required to learn how to make a difference between weather and climate, learn about various climatic phenomena, and learn about factors that affect climate change. They even have to participate in activities that reduce the risks and lessen the effect of climate change.

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<sup>63</sup> Li-Ching Ho & Tricia Seow (2017) Disciplinary boundaries and climate change education: teachers' conceptions of climate change education in the Philippines and Singapore, *International Research in Geographical and Environmental Education*, 26:3, 242-243, DOI: 10.1080/10382046.2017.1330038

## 7. VIETNAM

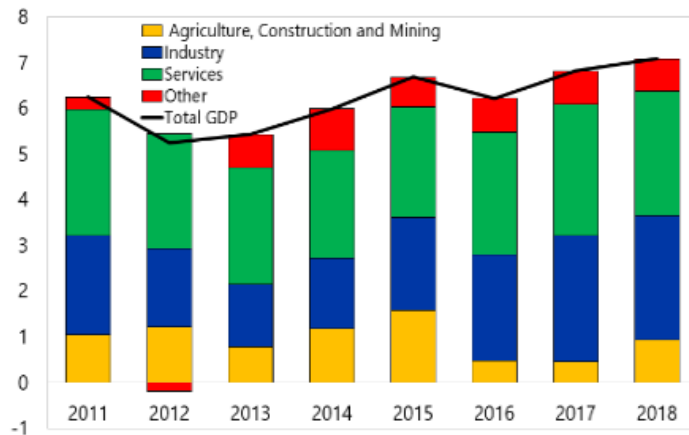
### 7.1. Economic overview

Figure 18: Economic Growth in Vietnam between 2011 and 2018

#### Strong growth

Strong economic growth is led by the service sector and industrial activity.

(year-on-year percent change)



Source: <https://www.imf.org/en/News/Articles/2019/07/11/na071619-five-charts-explain-vietnams-economic-outlook>

income country. During the first two decades of the 21<sup>st</sup> century, poverty rates dropped from 70% to below 6%, and the GDP per capita increased by 2.7 times. Only in 2019, the GDP grew by about 7%.

Unfortunately, there are also downsides to rapid economic growth. While Vietnam's population was only about 60 million in 1986, it has reached 97 million by 2018 and still increasing. Therefore, the demand for water and food supplies are on the increase even though water productivity is considerably low. Due to the rapid industrialization, energy consumption has tripled over the last decade and the power sector itself accounts for about two-thirds of Vietnam's greenhouse gas emissions because it relies on fossil fuels. No wonder that waste management and pollution are huge issues the country needs to face. The growing amount of marine plastic has a significant cost on the productivity of key sectors. 90% percent of marine plastic of the world comes only from 10 in-land rivers and the Mekong river is one of them.

From an economic point of view, Vietnam might be one – if not the most – exciting countries in Southeast Asia. Over the past 30 years, there have been remarkable economic and political developments under the Đổi Mới which was launched in 1986.<sup>64</sup> Thanks to its shift from a centrally planned to a market economy, it has managed to transform from being one of the poorest countries in the world into one of the most dynamic and fastest-growing states of the region and became a lower-middle-

<sup>64</sup> World Bank. 2020. *Overview*. [online] Available at: <https://www.worldbank.org/en/country/vietnam/overview>.

Also, Vietnam ranks among the top 10 countries with the most polluted air. The World Bank supports Vietnam in achieving green growth, especially through the Climate Change and Green Growth Development Financing agenda.

Vietnam’s main import partners are China (28%), South Korea (22%), Japan (8%), Taiwan (6%), Thailand (5 %), and the United States (4%).<sup>65</sup> The main import products are computers, electrical products, and parts (18%) and machines, instruments, and accessories (16%).

In 2019, Vietnam exported US\$304.3 billion worth of goods globally which means an 87.8% gain since 2015 and a 24.9% expansion from 2018 to 2019.<sup>66</sup> 54,4% of exported goods were delivered to other Asian countries, 22% were shipped to North America and 18.4% of exported goods were sold to Europe.

Table 6: Vietnam’s Top 10 Exports

1. Electrical machinery, equipment: US\$126.9 billion (41.7% of total exports)
2. Footwear: \$24.7 billion (8.1%)
3. Clothing, accessories (not knit or crochet): \$16.9 billion (5.5%)
4. Machinery including computers: \$16.7 billion (5.5%)
5. Knit or crochet clothing, accessories: \$16.1 billion (5.3%)
6. Furniture, bedding, lighting, signs, prefabricated buildings: \$12.3 billion (4.1%)
7. Optical, technical, medical apparatus: \$5.8 billion (1.9%)
8. Fish: \$5.6 billion (1.8%)
9. Leather/animal gut articles: \$4.6 billion (1.5%)
10. Plastics, plastic articles: \$4.5 billion (1.5%)

Source: <http://www.worldstopexports.com/vietnams-top-10-exports/>

Despite the absence of a legally binding agreement, a few years ago Vietnam announced to strive for a low-carbon economy.<sup>67</sup> The Socialist Republic of Vietnam is a one-party state ruled by the Communist Party of Vietnam ever since its reunification in 1976. However, in the mid-1980s the Party launched a socio-economic reform process, allowing private entrepreneurs to participate in the market. As a result, the GDP per capita more than tripled between 1990 and 2010, lifting a considerable part of the society out of absolute poverty. Consequently, significant indicators improved as well such as life expectancy and the Human Development

<sup>65</sup> Tradingeconomics.com. 2020. *Vietnam Imports | 1990-2020 Data | 2021-2022 Forecast | Historical | Chart | News*. [online] Available at: <https://tradingeconomics.com/vietnam/imports>.

<sup>66</sup>Workman, D., 2020. *Vietnam’S Top 10 Exports*. [online] World’s Top Exports. Available at: <http://www.worldstopexports.com/vietnams-top-10-exports/>.

<sup>67</sup> Anne Zimmer, M. J. J. C. S., 2015. What motivates Vietnam to strive for a low-carbon economy? — On the drivers of climate policy in a developing country. *Energy for Sustainable Development*, Volume 24, pp. 19-26.

Index. Around 2009 Vietnam was listed as a Low Middle-Income country by the World Bank as it had passed a certain threshold. Still, it is important to mention that the country received huge amounts of official development assistance (ODA). ODA accounted for up to 15% of the government budget and 3% of GDP. After reaching the Low Middle-Income status, many donors decided to reduce or withdraw their activities in the country. In the first decade of the 21<sup>st</sup> century, the industrialization of Vietnam strengthened and the sector experienced growth at more than 10% per annum, becoming the largest sector in Vietnam's GDP in 2006. Considering these facts, it is not surprising that while in 2000 the energy sector only accounted for about one-third of the total greenhouse gas emissions of the country, according to predictions made by the World Bank, this can even be three quarters by 2030. What caused severe environmental issues is not only the industrialization by itself but the increasing energy demand. What has been covered by renewable resources (mostly hydropower and traditional biomass) until 1990, is now covered by fossil fuels, in particular coal and oil. Even though most households have access to electricity, the state-owned utility Electricity Vietnam is responsible for ca. 60% of the country's electricity generation. Between 1971 and 2010, CO<sub>2</sub> emissions in the energy-related sectors are eight times as great as they used to be. This may seem incredibly much but the per capita CO<sub>2</sub> emissions remain far below the global average in Vietnam. On the other side, Vietnam's carbon intensity has increased by a higher volume than China's. All things considered, no wonder that Vietnam has been involved in international climate change mitigations since the 1990s. Still, the first national policy agenda was the National Target Program to Respond to Climate Change which was approved in 2008. This was followed by the National Climate Change Strategy in 2011 which aims to increase the share of new and renewable energy by 11% by 2050. The Vietnam National Green Growth Strategy was approved in 2012 and set the goal to achieve a low carbon economy. The first nuclear power plant was supposed to operate from 2020, however, plans were canceled in 2016. Originally, Vietnam planned to cover 10% of its electricity production by nuclear power. In addition, hydropower also plays an important role to produce electricity in the future. Years ago, the country covered its fossil energy demand primarily from domestic resources but since there is a growing demand, Vietnam is expected to become a net importer of both oil and gas. Unfortunately, Vietnam ranks among the lowest ten-nations in the world with regards to health-related air quality on the Environmental Performance Index. If we take these all together, it is quite easy to understand what motivates Vietnam to aim for a greener economy.

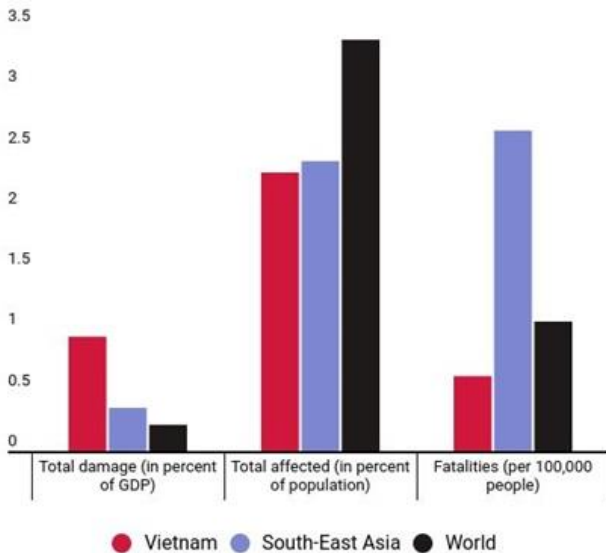
## 7.2.USAID Climate Change Risk Profile<sup>68</sup>

Figure 19: The Cost of Natural Disasters

### Deep impact

Every year since 1990, natural disasters in Vietnam have cost on average about 1% of GDP and caused 500 casualties.

(Impact of natural disasters: 1990-2016, average over the period)



Sources: Emergency Events Database (EM-DAT); World Development Indicators (WDI); IMF staff calculations.



Source: <https://www.imf.org/en/News/Articles/2018/01/09/NA010918-For-Vietnam-greener-growth-can-reduce-climate-change-risks>

pollution and warming water can harm fish growth and survival rate, not to mention a possible migration towards the north into cooler waters.

Vietnam's climate change risk profile states that about 1.5 percent of annual GDP is lost due to natural disasters. Almost 80% of Vietnamese farmers make their living of rice production on 45% of the country's agricultural land. Research suggests that due to extreme weather conditions, there is a possibility that there will be a 9.1 million tons loss of rice annually by 2050. In the present, the Mekong Delta produces 13% of the world's rice and according to projections 590,000 ha of these lands are at risk from inundation, resulting in production losses of 2.7 million metric tons per year. Another threat is altered river flows: the Mekong experienced its lowest levels and drought in a century in 2016. Of course, the fisheries sector – which is a source of livelihood for 4 million people – is also in danger. Water

<sup>68</sup> Climatelinks.org. 2020. [online] Available at: [https://www.climatelinks.org/sites/default/files/asset/document/2017\\_USAID\\_Vietnam%20climate%20risk%20profile.pdf](https://www.climatelinks.org/sites/default/files/asset/document/2017_USAID_Vietnam%20climate%20risk%20profile.pdf).

### 7.3. Discussion with a counselor from the Embassy of Hungary, Hanoi

I have reached out to the Embassy of Hungary based in Hanoi with my questionnaire and received the below replies for some of them:

- 1) Southeast Asia is among the most affected regions in the world regarding climate change. Could you please briefly explain what the main direct consequences are of climate change on the economy (agriculture, industry, tourism) and society (food security, famine, drought etc.)?

*Climate change has a huge impact in the southern provinces of Vietnam, in the Mekong Delta, which is often referred to as the country's agriculture and aquaculture hub. According to the UNDP, the fertile region produces roughly 70 percent of Vietnam's agricultural products, including around 55 percent of rice and 70 percent of all aquaculture. Agriculture is threatened by droughts in the dry season and floods in the rainy season, as well as from saltwater intrusion and rising sea levels (in 2020, the region had to face a drought never seen before). Water shortages affect the daily lives of people, as their access to potable water is threatened – therefore, water security of the region is at risk.*

1. Did the government ever have to relocate residents due to the consequences of climate change? If not, how likely you think planned relocations would happen in the future?

*There was no relocation so far that is directly linked to the consequences of climate change, and, in my opinion, is unlikely to happen in the near future.*

- 2) Do you experience any change in domestic or international migration due to climate change?

*In Vietnam, the percentage of the rural population is still high (64%). Domestic migration to the cities, therefore growing urbanization is ongoing – climate change might affect the decisions of Vietnamese people to move to the cities, but the main reason is economical: they move to the cities for the higher wages. (For example, if, due to the consequences of climate change, a farmer is unable to produce products on his land, might decide to move to a bigger city – but I have not seen any statistics yet which reveals climate change as a reason for migration).*

- 3) Has climate change affected the biodiversity (extinction of endangered species or appearance of new ones)? What effect does it pose on your country's economy?

*The biodiversity of Vietnam is at high risk. Climate change threatens species-rich habitats in protected lands in the country. Temperature increases, variations in precipitation, and sea-level rise will affect the country's wildlife. Also, Vietnam is one of the most vulnerable countries when we talk about the effects of climate change, due to its geography: the country has a 1,800 mile-long coastline that faces the East Sea, so it also faces tropical storms and typhoons every year. Landslides and flash floods occur in the mountainous far north, while the flat Mekong Delta in the south is among the most vulnerable regions in the world to rising sea levels. As the Mekong Delta is key to Vietnam food security, any vulnerabilities might have a direct effect on the country's economy.*

- 4) Do you experience increased soil, air, or water pollution?

*Yes, all of them. For example, tap water is not potable even if purified, so drinking water must be purchased separately. Moreover, in Hanoi, air pollution is a huge issue.*

- 5) Do you consider disaster aid allocation effective? What are your thoughts on it?

*In my opinion, disaster aid allocation is quite effective in the country.*

The above information was provided by Nikoletta Oláh who is a counselor of economic and commercial affairs.

## 7.4. Energy Consumption

The rise in temperature alters the demand for energy use. According to forecasts, a 180 percent increase in the number of heatwaves can be expected. In order to effectively work, people need air conditioners, industrial cooling, and agricultural drainage pumps. Regrettably, increasing temperatures have reduced hydropower production potential by altering river flows and runoff dynamics.

Climate change could be defined as “any long-term significant change in the “average weather” that a given region experiences due to the direct and indirect impact of human activities resulting in global warming and extreme weather conditions.”<sup>69</sup> The main causes of climate change - such as the increase of Green House Gases due to the burning of fossil fuels for energy - can be attributed to human activities. Vietnam’s greenhouse gas emissions are about 1.6 tons of carbon dioxide equivalent per capita which is a modest contribution to GHG emissions causing global warming. As a comparison, the United States is responsible for more than 20 tons per capita per year. Still, Vietnam is much more vulnerable to the effects of climate change. The reason for that is that it is located in South East Asia with 3,260 km of coastline in the tropical monsoon area and is under the influence of the typhoon center in the West of the Pacific. Thus, Vietnam is among the top disaster-hit countries in the world. In 2009, a World Bank report declared Vietnam as one of the five countries in the world to be most affected by climate change. Around 70% of the Vietnamese population is highly exposed to the negatives consequences of climate change (heat waves, intense rainfalls, drought, and typhoons). Between 1953 and 2010, 77 million people were affected by natural disasters in Vietnam, and about 25,000 were killed, not to mention the financial loss of over 7 billion USD. In the past decades, the Vietnamese economy became more and more vulnerable to climate change. Among the reasons are the privatization of many public sectors, decline in the diversity of the crops harvested in many agricultural areas, the loss of mangroves for shrimp farming for global export and eroded safety nets leaving individual households with more responsibilities. Households in rural areas have a climate-sensitive resource dependence.

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<sup>69</sup> Trung, P. T., 2013. Climate change and its gendered impacts on agriculture in Vietnam. *International Journal of Development and Sustainability*, Volume Volume 2 Number 1, pp. 52-62.



## 7.5. Food Security

Global warming does not only have a devastating impact on the economy but also has a negative sociological effect. As of 2014, agriculture accounts for ca. 20% of GDP, and about 70% of the Vietnamese population resides in rural areas.<sup>70</sup> This 70 percent mainly consists of rice farmers, producing the most important export product, thus making the agricultural sector crucial to food security and poverty reduction. Vietnam is extremely exposed to the consequences of climate change. Due to its long coastline and delta structure it is sensitive to flooding and extreme weather. As a result, changes in land use patterns play a key role in climate change mitigation and adaptation. In the first decade of the 21<sup>st</sup> century, Vietnam experienced rapid growth in GDP (6-8% a year) which led to an exponential increase in greenhouse gas (GHG) emissions. In 2010, for instance, 53% of the 151 million tons of GHG in carbon dioxide equivalent were attributed to land-use change and agriculture. The main reasons behind the changes in land use are rapid population growth, climate change, international trade, and technological development. In particular, two areas are threatened by floods which could jeopardize around 67% of the total population and over 400 billion USD in assets. This means that climate change and the related risk of flooding pose a serious threat to the paddy rice fields in the before-mentioned two areas. These dangers to international trade and domestic food consumption underscore the need for the Vietnamese government to take adaptive measures to climate change. These include raising public awareness, investing in different protective measures such as sea dikes and storm shelter port systems, and investing in agriculture in a way that allows farmers to adapt to climate change (e.g. upgrading irrigation systems and developing crop patterns suitable to climate change). The possible loss of paddy rice fields and natural forests may negatively affect food security and the economy.

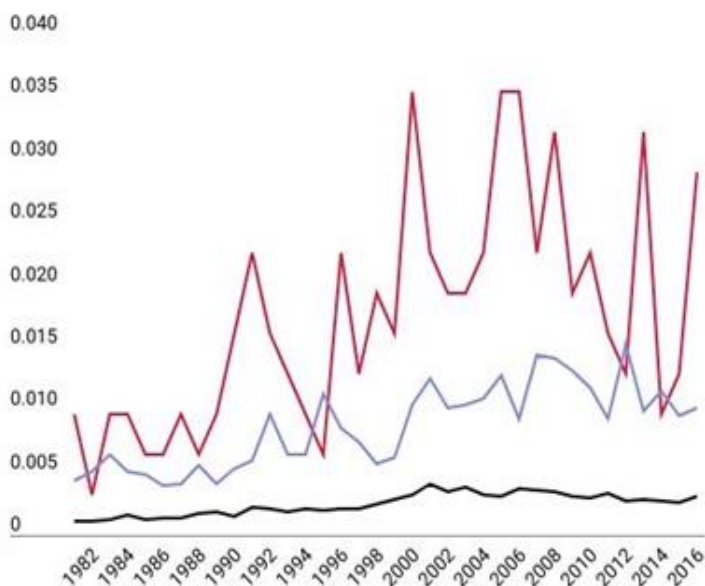
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<sup>70</sup> Martine Rutten Michiel Van Dijk, W. V. R. H. H., 2014. Land Use Dynamics, Climate Change, and Food Security in Vietnam: A Global-to-local Modeling Approach. *World Development*, Volume Vol. xx, p. 29–44.

Figure 20: Number of Natural Disasters in Vietnam Between 1980 and 2016

**Natural Disasters: 1980-2016**  
 Rising temperatures and sea levels are increasing the frequency and intensity of natural disasters in Vietnam.

(per thousand square kilometer)



Source: <https://www.imf.org/en/News/Articles/2018/01/09/NA010918-For-Vietnam-greener-growth-can-reduce-climate-change-risks>

In the late 1990s, when rice self-sufficiency was assured, the government has begun to encourage the diversification into other crops. As a result of recognizing a growing need for climate change adaptation, diversification is considered as a way of spreading both climate and market risk. Also, there was a growing demand for a greater variety of agricultural products due to the rapid urbanization of the population. During 2014-2020, there is a national target to convert 770,000 hectares of rice to other crops, intended to reach 30% of the cultivated land area. moreover, Vietnam also aims to increase animal feed production in order to support the rapidly growing livestock industry. In contrary to the country's success in expanding rice exports, feed imports can be twice the level of rice exports. In 2014, for instance, feed imports were about 11 million tons and cost 4.8 million USD, whereas exports were approximately 6 million tons and valued 3.02 million USD. In 2009, the Government introduced Climate Change Action Plans (CAP) at the provincial government level. The government provided support for each province a grant of US\$50,000-70,000 to prepare for CAP. Quang Binh is a province that

An article from 2016, presents cases to illustrate how climate and agricultural risks are managed by farmers, private investors, and local authorities in Vietnam.<sup>71</sup> The focus is on two provinces in Central Vietnam – Thua Thien Hue and Quang Binh – and through their examples, we can see how gradual changes affect decision-makers. After the war ended in 1975, food security was measured and met by setting national- and provincial levels of rice production. The targets were enforced through constant control and directives. However, after the liberalization reforms, some provinces began testing the limits

<sup>71</sup> Ian Christoplos, Le Duc Ngoan, Le Thi Hoa Sen, Nguyen Thi Thanh Huong & Huy Nguyen (2017) Changing arenas for agricultural climate change adaptation in Vietnam, *Development in Practice*, 27:2, 133-139.

has often failed to meet the national and provincial targets and ended up having to “import” rice from other provinces to meet the demand. Farmers reportedly faced climate-related livelihood challenges due to the uncertainty when seasonal monsoons will start. when rains started early, farmers have frequently lost their second crop of rice. The probability of early annual floods is ca. 50% and approximately 90% of the crop is lost. Consequently, in a few areas of the Le Thuy district began to experiment with an entirely new approach: leaving the rice plants from the first rice season to merely regenerate instead of making the risky investment in plowing and planting for the second season, a method called ratoon rice. Even though ratoon rice fields were smaller and uncertain, so was labor and money. Thus, risks were reduced and profitability was higher. As this new method became more and more popular among farmers, prices also became higher as consumers preferred the taste of the ratoon rice. This new trend was not welcomed by provincial authorities, who considered this as reducing their already insufficient production towards targets. The case was investigated by district agricultural staff and farmers managed to convince them that there was merit in ratoon rice. Even so, the province started zoning areas for ratoon rice in 2014 and by 2013, 100% of lowland areas in the district used ratoon rice.

The same article represents another study with regards to aquaculture. As a response to both expanding salinization in coastal areas and recognition of potential markets for new products, the government started rezoning marginal areas to start the conversion from rice to aquaculture in the 1990s. By 2012, the total area of paddy land converted into aquaculture was approximately 350,000 hectares, mostly concentrated in the Mekong Delta. Unfortunately, the rapid growth in aquaculture resulted in new and different risks. Due to the unpredictable and extreme weather events, the salinity levels of ponds changed killing the shrimp or ponds that were flooded enabling shrimp to escape. Another major problem is the outbreak of diseases causing massive losses. In 2008, for example, the Tam Giang Lagoon on the south of Quang Binh, the production area decreased from 4,000 hectares to 2,700 spurred by deteriorating water quality and consequent spread of disease. It is no surprise that aquacultural production has begun to shift from monoculture shrimp production to lower risk and less intensive polyculture including seaweed, shrimp, crabs, and fish. In North Central Vietnam, the production of shrimp has doubled over the last decade while growth in the land area has only been about 20%. This is a result of the new ponds where water is pumped directly from the sea making it easier to control salinity level and significantly reducing the risk of spreading diseases from neighboring ponds. Still, these intensifications and expansions have been accompanied by risks. Many farmers experience production crashes which lead to indebtedness and bankruptcies. According

to the provincial authorities of Quang Binh, most of the aquaculture losses resulted from natural hazards and diseases. One of the biggest catastrophes to mention is typhoon Wutip from 2013 which destroyed 289 hectares of aquacultural production and 29 fish cages causing an estimated loss of VND 56.955 billion. Epidemics can be a bit easier to handle though still challenging as authorities now provide recommendations for changes in breeds, feeding, and production timing. However, their capacity is extremely limited as most districts only have one person working with this. To provide more support for farmers, there are also television programs and call-in helplines on how to deal with diseases.

## **7.6. Adaptation Measures**

A recent paper from Fiona Miller and Olivia Dun examines the role of planned resettlement in climate change adaptation planning and the confronting issues of urbanization and sustainable land and water usage.<sup>72</sup> In the past decades, there have been several studies on the relationship between population displacement, migration, and environmental changes. However, there are far fewer studies on planned relocations made necessary by the effects of climate change. The above-mentioned study seeks to understand whether planned resettlement can be considered as a successful adaptation measure in the context of responding to the impacts of climate change. To begin with, adaptation measures are supposed to *'decrease the population's vulnerability to harm and exposure to environmental or other risks'*. Still, such resettlement processes can result in causing greater harm for those people who lack access to crucial livelihood assets and strategies. Those who belong here, resettlement can undermine their ability to cope with future challenges. When it comes to the proportion of the population living in low-elevation coastal zones, Vietnam ranks fifth globally. Coastal dwellers are the most exposed to the anticipated increased number of typhoons and tropical depressions. Consequently, these people are the most like to face displacement. According to an assessment by the Vietnamese Ministry of Natural Resources and Environment, sea level might rise by a meter and 39% of the Mekong Delta River would be at risk of flooding. It is quite straightforward that the Vietnamese government considers resettlement as one of the key strategies in climate change adaptation. Yet, it is important to mention that this is not a new policy in Vietnam as the country has a long history of government-initiated planned resettlement for various reasons (environmental, economic, and political). Over the years, there have been dam-related resettlements as well resettlement induced urban renewal and upgrades and resettlement project due to slow-onset

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<sup>72</sup> Fiona Miller, O. D., 2019. Resettlement and the environment in Vietnam: Implications for climate change adaptation planning. *Asia Pacific Viewpoint*, Vol. 60(No. 2), p. 132–147.

environmental changes such as subsidence, riverbank erosion, flooding, wave activity, and riverbank erosion. In the Mekong Delta, for instance, from the mid-1970s to the mid-1990s there was a resettlement project due to flooding which affected about 6 million people and resulted in the creation of New Economic Zones in rural areas. However, resettlement is rather expensive and its true cost cannot easily be foreseen. Also, relocation always involves some damage and loss. It is important to note that the success of resettlement mostly depends on local authorities. Relocated citizens often became even more vulnerable due to many reasons:

- The disruption of social networks often leads to a state of isolation
- The increased distance from fields means less income
- The same applies to the prohibition of livelihood activities
- Dwellers become dependent on government loans due to construction costs

Currently, there are also relocation projects going on. Luckily, there is an increased presence of international financial donors, meaning the World Bank and the Asian Development Bank. With their assistance, there has already been some improvement in resettlement policies and people receive considerable more support – like ‘land-for-land’ compensation to re-establish their livelihoods. Still, we can say that resettlement is usually among the last options for the government.

Between 1990 and 2004, Vietnam experienced an 878% increase in GHG emissions which is the highest value among the ASEAN nations.<sup>73</sup> Consequently, energy issues are prioritized on the country’s transformation agenda due to the growing need for energy supplies, dependence on fossil fuels, and large pockets of energy poverty. The government issued several policies to increase energy efficiency and reduce GHG emissions. This includes the National Target on Energy Efficiency (2006), National Energy Development Strategy (2007), policies on carbon trading, and the Law on the Economical and Efficient Use of Energy (2010). It is quite fortunate that Vietnam is highly suitable for the development of renewable energy such as solar, wind, hydropower, and biomass. The first wind farm was completed back in 2009 in Binh Thuan Province. Solar energy is mostly used for heat purposes and hydropower relies on small-scale hydropower dams. As of now, the government hopes to replace about 8GW of the coal-based electricity plants with renewable electricity plants by 2030. However, solar and wind energy development faces a few barriers: lack of local expertise, technology costs, need for

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<sup>73</sup> Urban, F., Siciliano, G., Wallbott, L., Lederer, M. and Dang Nguyen, A., 2018. *Green Transformations In Vietnam's Energy Sector*. pp. 565-567. [online] Available at: <https://onlinelibrary.wiley.com/doi/full/10.1002/app5.251>.

financial investments from abroad, internal tariffs, and lack of financial incentives. Currently, there are three different strategies in Vietnam concerning green transformation: the National Strategy on Climate Change (2011), the Green Growth Strategy (2012), the Green Growth Action Plan (2014). All three have different policies and intervention plans but communication among them is not sufficiently coordinated.

## 8. CONCLUSION

In this thesis, I gave a general overview of the impacts of climate change on the economic development of Southeast Asia. I have decided to focus on the four countries the IMF considers as the most affected ones: Thailand, Myanmar, the Philippines, and Vietnam. By narrowing down my research, I was able to introduce individual cases and diverse adaptation measures.

The paper – after the introduction and research method - starts with a general overview of the struggles the region faces. I have also included Indonesia as this research would not have felt complete without this country. Globalization, urbanization, deforestation, poverty, and tourism are among the main contributors to global warming. I continued by questioning the justification of the Mekong dams, considering their negative impact not only on the economy but also on biodiversity. The key findings are that even though hydropower dams are considered to be a source of renewable energy, they are rather harmful to the environment. Furthermore, it is not only China that builds dams on the Mekong but also those countries who suffer the most because of them, including Vietnam. This means that environmental consequences are often ignored and instead economic development and energy production are prioritized.

The next section gives an insight into the above mentioned four countries. I have included a brief economic overview and the USAID Climate Change Risk Profile as well in every section to have some knowledge of the main economic indicators, key sectors, and the threats they are facing. Each country has its issues and they come up with surprising innovations to adapt to climate change. Thailand has built the Chulalongkorn University Centenary Park which can store even a million gallons of water in case of flooding, Filipinos believe in the power of community funding and Vietnam put floating solar panels on the Mekong. Due to its poverty and weak institutional system, Myanmar might be in the hardest position. They focus on meeting their targets to reduce greenhouse gas emissions and preserve their forests.

Even though I was not able to conduct as much and as detailed interviews as I wished due to the coronavirus outbreak, I did manage to obtain some primary resources from trustworthy resources. Among them are researcher Richard Doner and Peter Klemensits and the Embassies of Vietnam, Thailand, and Myanmar.

In my opinion, the main takeaway of this thesis is that even though the analyzed countries are located in the same region, each of them is unique in their attribution to climate change and sometimes their goodwill and efforts are just not enough. Governments struggle to meet their targets and they tend to blame Western nations for generating global warming. They lack the

expertise and financial resources to fight extreme weather conditions and their consequences while coming up with different adaptation measures. Communities react differently to the increased number of natural hazards: some are in denial while others cooperate in collective funding. As Southeast Asia aims for economic development and to overcome poverty, interests often clash and governments have to choose between economic growth and environmental development. A fine example of this is the Philippines where President Duterte often finds himself in such a situation. Other leaders – like in Myanmar – tend to legitimize their economic goals by reframing them and convince people that certain investments serve the environment, even if it does not reflect the utmost truth.



## 9. PRIMARY RESOURCES

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