Climate Change Impact on Education

Research report done for Aide et Action
On selected ASEAN Countries (Cambodia, Vietnam, Laos PDR)

Boey Chun Weng
Rina Morooka
Rustam Shariq Mujtaba
Yang Shitong

December 2020

Acknowledgement

We would like to thank our mentor, Tiziana Bombassei Frascani de Vettor, for her support and guidance in preparation of this report. We would also like to thank Sophat Sorn, founder and president of Cambodia Youth Action, for his time and effort to be interviewed for this report. His insight and sharings have helped shape our understanding of Cambodia's education situation for children and youth.

We would also like to thank AEA for this opportunity to work on this meaningful research project. It has widened our eyes to the climate situation these communities face and challenged us to seek preventive and mitigative solutions.

Contact

Boey Chun Weng, Chunwengb@u.nus.edu

Rina Morooka

Rustam Shariq Mujtaba

Yang Shitong, shitong.yang@sciencespo.fr

Global Research & Consulting Group (GRC)

Global Research & Consulting (GRC) is a 501(c)(3) non-profit with the mission of helping global Non-Governmental Organizations (NGO) and social impact start-ups achieve their goals while simultaneously empowering students to give back to the global community. GRC's philosophy is to attract talented, ambitious students who are passionate about social impact and give them the necessary tools and training to make a positive impact around the world. To date, we have over 100 social impact projects per year and over 500 active members globally across 17 universities including MIT, Stanford, Harvard, Oxford and Cambridge.

GRC NUS & GRC Sci Po is a branch consisting of students from the National University of Singapore (NUS) and The Paris Institute of Political Studies (Sci Po). The branches aim to provide services in areas of strategic advisory, research, as well as impact measurement and evaluation advice to clients.

Aide et Action (AEA)

Changing the world through Education

Aide et Action is an international non-profit working in 19 countries around the world supporting the development of sustainable education projects. Headquartered in Europe, we have been implementing projects globally for almost 40 years. Aide et Action ensures access to quality education for the most vulnerable and marginalised populations, especially children, so they can take charge of their own development and contribute to a more peaceful and sustainable world.

Aide et Action Southeast Asia was first set up in 2003 with projects spanning across Cambodia, Laos PDR, and Vietnam. It focuses on early childhood care and education, access and quality of education at primary & secondary level, livelihood education for youth and adults through vocational training, girls and women's education and inclusive education. This is done by promoting citizenship education and mobilizing citizens for social change while acting as an advocate for these issues to institutions and public authorities.

Abbreviations

ADPC	Asian Disaster Preparedness Center
AEA	Aide et Action Southeast Asia
ASEAN	Association of Southeast Asian Nations
ARR	Advancing the Right to Read
CMIP5	Coupled Model Intercomparison Project Phase 5 for climate change
CCCA	Cambodia Climate Change Alliance
CCCSP	Cambodia Climate Change Strategic Plan
CCD	Climate Change Department (Cambodia)
CCDRR	Child-Centred Disaster Risk Reduction

CCFF	Climate Change Financing Framework (Cambodia)
CCTT	Climate Change Technical Team (Cambodia)
CSO	Civil Society Organization
DNA	Designated National Authority
EDC	Education Development Center
FAO	Food and Agriculture Organization of the United Nations
GEF	Global Environment Facility
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IEQ	Indoor Environmental Quality
JICA	Japan International Cooperation Agency
KAPE	Kampuchea Action to Promote Education
KOICA	Korea International Cooperation Agency
Lao PDR	Lao People's Democratic Republic
NAPA	National Adaptation Program of Action (Cambodia)
NAPA	National Adaptation Plan of Action (Lao PDR)
NCCC	National Climate Change Committee (Cambodia)
NCCC	National Committee on Climate Change (Vietnam)
NGO	Non-Governmental Organization
NRES	National Natural Resources and Environmental Strategy
NSDP	National Strategic Development Plan (Cambodia)
NSEDP	National Social Economic Development Plan (Lao PDR)

NTP-RCC	Vietnam’s National Target Programme to Respond to Climate Change
MoE	Ministry of Environment (Cambodia)
MoEYS	Ministry of Education, Youth and Sports (Cambodia)
MONRE	Ministry of Natural Resource and Environment (Vietnam)
MONRE	Ministry of Natural Resources and Environment (Lao PDR)
MT	Model Teacher
PIN	People in Need
PLC	Peer-learning Circles
RGC	Royal Government of Cambodia
UN	United Nations
UNESCO	United Nations Educational, Scientific & Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Introduction & Methodology

Climate change is driven by global warming and has caused phenomenon like changes in rainfall pattern and extreme weather. With the projected rise in temperature globally by 2 degree celsius. These phenomena will persist and affect people all around the world. This report seeks to develop insights into the near-term impact of climate change on education for children and youths. It also aims at supporting Aide et Action (AEA)to enhance operational climate resilience. The country of focus includes Cambodia, Vietnam and Laos.

The report breaks down the geographical and educational system of each country and identifies the key vulnerabilities faced by each community in the face of climate change. Underlying these vulnerabilities are five key areas impacting education of youth and children, namely health, food security, school infrastructure, poverty and migration.

This report also looks into how authorities and international organisations are stepping up to the challenge to meet the impending needs of these communities, and, with the simple mapping, propose recommendations for AEA.

The insight report is undertaken primarily through desktop research between September and December 2020. An interview was also conducted with Sophat Sorn, founder and president of Cambodia Youth Action.

Literature Review

Health Impact on Education

There are 3 main pathways how climate change physically affect children:

Direct heat exposure: It affects fetal development, leading to adverse birth outcomes including low birthweight and preterm birth (Kuehn et al, 2017). Children under 10 years of age born with low birth weights are found to have around 5 points lower cognitive scores, IQ scores, motor scores, compared to normal birth weight children. Additionally, the risk of cognitive and motor deficits in low birthweight children seem to persist throughout the transition from early childhood to adolescence (Updahyay et al, 2019).

Infectious Diseases: With climate change, there is greater emergence of infectious diseases like malaria and cholera. It also affects the way these diseases are introduced and disseminated. The most sensitive of these diseases are mosquito-borne diseases, such as malaria, dengue and viral encephalitides (Patz et al, 1996).

These diseases can affect the health and mortality of children whose less developed immune systems affect their survival rate with these illnesses. The Global Burden of Disease Study 2010 estimated that 64% (4.9 million) of the 7.6 million deaths in children younger than 5 years were attributable to infectious causes, with pneumonia (14.1% ; 1.1 million), diarrhoea (9.9% ; 0.8 million) and malaria (7.4% ; 0.6 million) claiming the most lives of children who survived the neonatal period (First 4 weeks) (Liu et al, 2012).

These can also negatively impact cognitive development and educational outcomes. Newer research has shown that some diseases may affect educational outcomes long term. However, not all diseases have these implications. A case in point is a study conducted in 2015 in Thailand on the effect of Malaria, with school absenteeism playing a more significant influence on children rather than the disease itself (Vorasan et al, 2015).

Extreme weather: Prenatal and youth exposure to extreme weather events like natural disasters has been shown to impact children's educational outcomes, particularly among poor households. A study published in Future of Children, a cross-disciplinary academic journal pertaining to children, showcases the psychological impacts of natural disasters on children (C Kousky, 2016) due to the physical, mental and social harm done to them.

Food Security Impact on Education

According to the Food and Agriculture Organization of the United Nations (FAO) (2001a), food security is a situation when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life. It highlights four pillars of food security, namely availability, access, utilisation and stability. Climate and non-climate stressors can impact these pillars of food security, ultimately affecting children development.

Household food insecurity not only affects normal physical growth of young children, but also adversely affects their intellectual capacity and social skills. Studies showed that household food insecurity has a significant association with students' poor school attendance (Tamiru et al, 2017). Students are more likely to be absent from school compared to their peers from food-secure households, driven by an increased exposure to socio-emotional difficulties and malnutrition-associated factors. The same study also found that children facing food insecurity score low grades and are more likely to repeat the same grade compared to their peers from food secure households, indicating a direct correlation.

Among 6- to 12-y-old children, food insufficiency was associated with poorer mathematics scores, grade repetition, absenteeism, tardiness.

Among 15- to 16-y-old adolescents, food insufficiency was associated with depressive disorders and suicide symptoms after controlling for income and other factors.

Findings also suggest they have lower intellectual stimulation, poorer physical growth and most of the time they suffer from long-lasting conditions such as obesity and anxiety disorders. Although the study primarily focused on children and youths from the western hemisphere (North and Latin America), the study was conducted in related circumstances such as food security due to low incomes and climate change-related disasters. Additionally, there is growing interest and research in how education can help combat food insecurity. Initiatives taken include school gardens, school feeding, and the development of literacy skills, especially for girls. Depending on the design and implementation of these activities, the education provided can address one or more of the four pillars of food security and mitigate these effects on children in multiple, mutually reinforcing ways.

School Infrastructure Impact on Education

Access to safe and healthy school places play a significant impact on educational progress. Research from the World Bank Report has shown that appropriate and compatible physical layout of the school and pedagogical practice can maximise educational benefits. Practical considerations in developing school infrastructure and curriculum include:

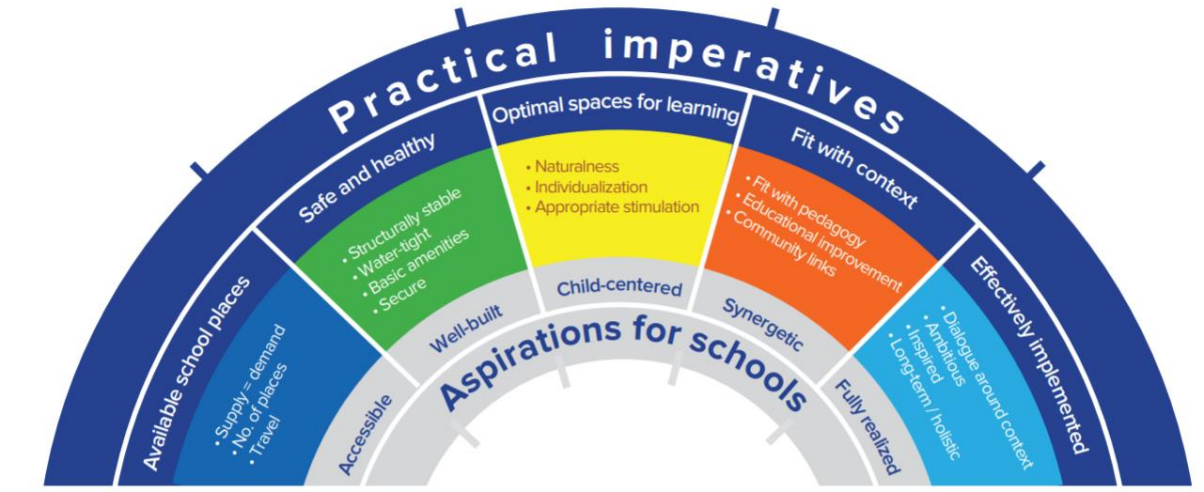


Figure 1: School infrastructure best practices, Reference from World Bank Report for *Impact of School Infrastructure on Learning* (2019)

Findings are categorised into 5 main dimensions of focus:

1) Accessibility of School
2) Safety and Health
3) Optimal Spaces for learning
4) Synergy with pedagogy and community
5) Effective Implementation of the School project

Focusing on the physical infrastructure of schools and their impact of educational outcomes, the major factors consist of the first 3 dimensions.

A worldwide study by UNDP in 2006 has shown that children lose 443 million school days each year due to water-related illnesses, with 272 million lost due to diarrhea alone. >40% of diarrhea cases among school children are the result of transmission in schools rather than in homes.

Furthermore, schools also aid in physical development given the physical and recreation activities in student curriculum. Additionally, research has shown that the state of infrastructure was found to be a significant factor for teachers to stay in countries like Cambodia and Laos (Sisoupanthong et al, 2020). With studies finding that turnover of teachers halfway negatively

affecting education outcomes (Henry & Redding, 2020), it is definitely important to ensure a conducive environment is met for both teachers and students.

Design of classrooms have also shown direct impacts on education through their conduciveness for learning. Parameters such as Indoor Environmental Quality (IEQ) have been determined to be highly correlated with academic outcomes e.g Light, Air Quality, Temperature and Acoustics. These natural qualities aid multi-sensorial input and have been proven to improve standards of learning once optimised.

Income effect on Children's Education

Climate change influences the livelihoods of individuals but its effect differs depending on the exposure and vulnerability of the individual. The effect of each of the three countries will be explored in a later part of the paper. However, the effect is common, with reduced income for households. These would affect the decision of households to send children to school in the following manner:

i) A direct economic loss in income due to reduced (child) labour on familial farmland.

ii) A low perceived return of formal education affects how parents decide how their children spend their time. They may have a preference for their children to commit to laborious work rather than formal education for their development. In a study by Woldehanna et al (2008) on Ethiopian children and family, their focus group discussion and quantitative analysis point to a cultural aspect in decision making. A significant number of parents, child involvement in household or paid labour was seen as a natural, unavoidable responsibility. They see childwork as a contribution to the pool of family labour but also acts as a training for skill acquisition for the future. These are due to the low observable benefit of education or a low perception of education in their community for their children.

iii) Cultural biases against girls' education in the household (Woldehanna et al, 2008, Brooks-Gunn & Duncan, 1997).

iv) An inability to afford the relatively high cost of education (Brown & Park, 2002).

v) A potential economic loss from child marriage (UNICEF, 2016). Child marriage is an alternative pathway for income diversification for the family. The receiving family would have more labour for their family farm production while the sending family receives remittances from their child and there is one less mouth to feed. In such cases, the child's agency is passed on between the families and the decision for their education is less prized with the marriage. Angélique Kidjo, a UNICEF Goodwill ambassador observed this in her work in South Asia and Sub-saharan Africa, where children's education, particularly girls, are cut short. "Girls lose the chance to gain the skills and knowledge to secure a good job and provide for themselves and their families. They are socially isolated...and are more vulnerable."

The complex decision of a child's education is, essentially, still driven by an economic trade off the household undertakes. In many of these contexts, the lowered income provides additional pressure to pull children out of school due to the unaffordable direct cost of school

fees or the indirect income sacrifice that comes with the decision to school children.

Migration effect on Children's Education

Movement of people in response to climate risk is complex and it differs by context, but these different types of movement can be categorised as (1) Migration, (2) Displacement and (3) Planned Relocation (Warner et al., 2013). Most of these climate-induced migrants and displaced people move to urban centres or neighbouring countries if the opportunities arise depending on the context (Mosel and Jackson, 2013).

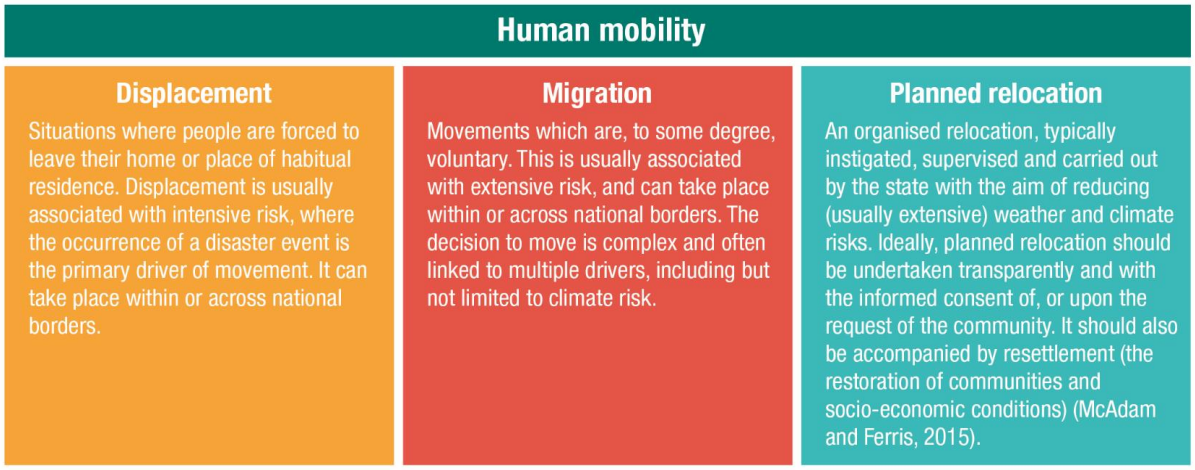


Figure 2: Migration Typology, Reference from UN Report *"Changing Climate and Moving People: Framing Migration, Displacement and Planned Relocation"* (2013)

When looking at the impact of migration on educational attainment, the effect depends on the movement of the child, on whether migratory parents would leave their children behind with a caregiver such as a grandparent or bring them along with the movement.

A framework by McKenzie and Rapoport (2006) breaks down these migration influences on educational decisions into three channels: the income effect brought about by remittances; the direct effect of adult migration on the demand for child work; and the impact of the prospect to migrate upon the incentives to invest in education. For this report, the latter effect is a factor for migration that decision makers account for but it will not be discussed because of the relatively indirect impact from climate change.

i) Left-behind children: Remittances for education

Remittances relax the household's budget constraint which was previously limiting the investment in education. Cox-Edwards and Ureta (2003), in the context of families from El Salvador, find that remittances significantly reduce the drop-out rate of individuals aged 6 to 24. Looking at the same hypothesis, Hanson, and Woodruff (2003) find that in Mexico, children in migrant households complete significantly more grades of school at a given age than do other children.

ii) Left-behind children: Direct effect of adult migration

The departure of wage earners of a household can also disrupt family life. The reduction in the number of adults in a home increases the child-rearing responsibilities of resident

household members, placing greater demands on older children to assist in running and supporting the household (Hanson and Woodruff 2003; Acosta 2006). This makes it harder for children to remain in school. These responsibilities can take the form of caregiver for the family or farm work and domestic work. Chang et al (2011) used a multivariate analysis on the China Health and Nutrition Survey between 1997-2006 and demonstrated how the migration of household members increases the time spent on farm work and domestic work by the left-behind children. The effect defers along the gender of the child, but it nonetheless deters their educational attainment later in their lives.

Without parental care, the role of caregiver of children may also lie on grandparents. Despite a similar well-intention for the child, there exists a difference between parental care and grandparental care. In a study on China's rural toddler, Yue et al (2017) find a difference in stimulating interaction for the toddler with activities such as singing and play activities. However, it does not lead to significant development delays for the toddler, an observation similarly found among 140,000 chinese children (Zhou, 2015). Instead, Yue et al (2017) suggest that a difference in children development and education lies primarily in the inadequate parenting style that is present in either parents or grandparents. Nonetheless, left-behind children still suffer from a lack of education compared to their peers and the actual causal relations are still being debatable in current literature.

iii) Family emigration

When children migrate with their parents, it poses another set of challenges. In a literature review of current emigration literature, Rossi (2008) highlighted that quantitative research assessing the impact of the migration of children on their education attainment in developing countries is almost non-existent. Current studies cite limitations on the information of children's nationality and place of birth to effectively map internal migration and analyse its effect.

However, according to qualitative available research, migration can lead to a positive impact on the education attainment of children. In many developing countries children move from rural to urban areas, sometimes with the specific objective to attend better or more advanced schools. This is because in most rural areas of developing countries, education is available only at primary level, and at a quality often lower than that in urban areas (Punch 2007).

Children who migrate from rural to urban areas also face challenges in pursuing education and are forced to work to aid in their family's financial situation. The cost of migration is high, and the employment opportunities present often takes time for these migrant families to search. Recently migrated families hence may not be able to afford school and choose to supplement family income with child labour (UN Dzud Appeal, 2010). The schooling system in these areas may also face overcrowding and refuse migrant children due to lack of capacity and proper documentation (UN Dzud Appeal, 2010). Children who are new to a school could also potentially experience discrimination (Batbaater et al, 2005). These effects are on top of the social network loss children face and a disruption in cultural identity for these children, compounding the challenges against their education attainment. To put these findings into context, a comparative study in Mongolia found migrant children are four times more likely to drop out of school than non-migrant children (Nenova-knight, 2011).

The conflicting effect suggests that the effect of migration on left-behind children would be influenced by the decision made within the household. Based on the interview conducted for

this report, it is suggested that the latter effect has a stronger influence. Anecdotal evidence shows that in Cambodia, children also shoulder the caregiver role for their elderly grandparents and younger siblings in the absence of their parents. These activities are highly time-consuming which lead to an observed increase in dropout rates and absenteeism. As for the overall effect on children that migrate with their parents, the effect is less clear and it depends on the context, vulnerabilities and challenges they face given the environmental change of migration.

Cambodia

Geography

Cambodia is a country situated in the Indochine, west and northwest of Thailand, northeast of Laos, east and southeast of Vietnam, and southwest of Gulf of Thailand. It has an area of approximately 181,035 km2, and is characterized by the Mekong river flowing south from eastern lands. Other landscapes include low and forested mountains, and plains. The two important waterways are the Mekong river and Tonle Sap which are connected with the Sab River. During the rainy season, water flows into Tonle Sap from the Mekong river, increasing the lake's surface, and in the dry season, the water flows back to the Mekong river.

The population is increasing above world average and latest statistics show the population is around 13,400,000, consisting mostly of Khmer/Cambodian ethnicity. Cambodia has a relatively young population with around 33% of the population below 15.

Settlement patterns show around 80% of its population live in rural areas in villages with less than 10,000 people. Otherwise, Phnom Penh is its dominant metropolis (UN, 2020).

Geography: Cambodian Districts near Freshwater Lakes

There are many small villages that center their living on fishing developed alongside the Tonle Sap Lake. Nutrients and fishes flow into the lake from the Mekong river during the wet season.

As for other sources of food, some of these communities grow rice in the fertile soils formed by the Mekong river, with natural irrigation during the wet season. However, these farming-based societies are often lacking electricity, thus China, Laos, and Cambodia are planning to launch a hydroelectricity and floodwater storage on the Mekong River upstream from Phnom Penh (Olson, Kenneth & Loi, 2018). This may change the current abundance of fishes and cause problems in fishing-based communities close to Tonle Sap Lake.

Communities near the Tonle Sap Lake are based on agriculture and fishing, although most of these communities are family-based and only rely on fishing to support household income, around 40% of families in the Tonle Sap Lake are commercial fishermen (Olson, Kenneth & Loi, 2018).

Livelihood in Cambodia

When observing Cambodia as a whole, its economy continues to develop with an average growth rate of 8% between 1998 and 2018 with 2019 having the growth rate of 7.1%. Cambodia's main economical driving forces are tourism, manufacturing exports, and construction which account for more than 70% of the country's growth and almost 40% of paid employment. However, the covid 19 outbreak is suspected to reduce the growth rate drastically due to the decrease in income from tourism.

Poverty rate has also decreased recently, with 13.5% in 2014 compared to 47.8% in 2007. However, many of the rural population still live below the poverty line since approximately 90% of the poor live in rural areas. Even for those who escaped the poverty line, they have only escaped it narrowly and are in the near-poor category (UN, 2020).

Livelihood in Cambodia: Communities around the Tonle Sap Lake

Fishing is an essential part of rural communities close to the Tonle Sap Lake since around 64% of the rural population participate in fishing activities. These fishery activities can be divided into family-based small businesses and commercial fishing. The two categories have conflicts regarding the places to fish since the species and number of fishes depend on places on the Tonle Sap Lake (Louise, 2019).

Majority of households close to the Tonle Sap lake engage in "small-scale artisanal and subsistence fishing, with supplemental income from agriculture, raising livestock, aquaculture, off-farm work, and remittances" (Louise, 2019). However, the lower income families often rely on income from these activities. The residents of floating houses along the Tonle Sap Lake are one of these families, with fishing income accounting for almost 70% of their income (Louise, 2019).

It is anticipated that the fishing industry in Cambodia may decline due to the proposed dam construction, overfishing due to population growth, and climate change. However, the low-income communities that are dependent on fishing will experience harder time adapting to new environments due to lack of education, and savings (Louise, 2019).

Education in Cambodia

In Cambodia, the net enrollment of children into primary education increased from 82% in 1997 to 97% in 2016, and lower secondary completion rates at 57%. However, this is lower than the average for lower-middle income countries (UN, 2020). Although nine years of free education for children is legally guaranteed by the government, there are several reasons behind this gap of education in Cambodia.

UNICEF reported that dropouts in Cambodia result from inadequate preparation for school, poor quality of teaching, absence, and irregular schooling. There are also problems of insufficient infrastructure, lack of nutrition which connect to lack of concentration of children, and discrimination towards disabled children as well. Schools can sometimes be a traumatic experience for students as it is still common for teachers to use corporal punishment. Another important and prevalent obstacle is lack of understanding of education for parents. This trend

is stronger in rural, poverty-stricken areas that find it difficult to afford education for their children. Moreover, there are still gender gaps in education (UNICEF, 2020).

Climate Impact in Cambodia

Overall, Southeast Asia including Cambodia is named as a 'climate change hotspot' and Cambodia is viewed as one of the most vulnerable countries in Southeast Asia to the impacts of climate change (Davies, 2015). The effects from climate change include, but are not limited to, tropical cyclones, landslides, droughts, and sea level rise. When brought together, these effects can be captured under the metrics of adaptive capacity. It is defined as, "the capacity of a system or population to adapt to climatic stimuli or their effects or impacts and factors include socio-economic factors, technology and infrastructure. It is thus a determinant of overall vulnerability, but is a distinct concept requiring separate consideration in the context of building resilience to disasters and climate change.". Davies (2005) indicated Cambodia as one of the lowest adaptive capacities in Southeast Asia, next to Laos, suggesting that the impact warrants a lookover.

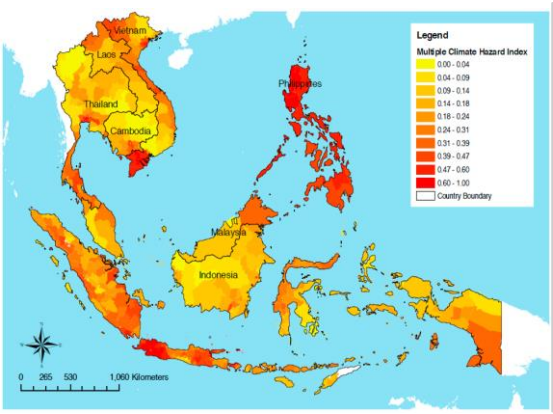


Figure 3 Climate change hotspot from Davies (2005)

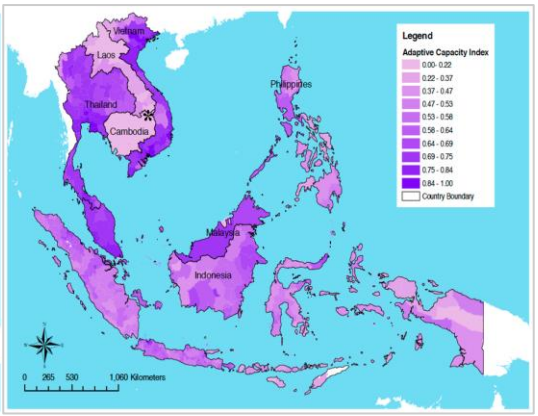


Figure 4 Climate change adaptive capacity from Davies (2005)

Climate change in Fishing-based, Coastal Areas of Cambodia

In the case of water-based coastal areas of Cambodia such as the Mekong River and Tonle Sap Lake, it is estimated that climate change will impact the hydrology of the area in the long-term. The area which is estimated to be most influenced from climate change is the regional area of the entire Mekong River Basin although Tonle Sap Lake based regions will also be impacted (Nuorteva et al, 2010). According to climate change scenarios, it is assumed that the wet-season water level in the Tonle Sap Lake is likely to be higher and this leads to the rise in seasonally flooded areas and change in the height of the flood peak. The period of floods is also estimated to change. The flood duration will be longer, starting several days earlier and ending several days later (Nuorteva et al, 2010). Moreover, the intensity of flood may become stronger as well as a rise in the number of floods. Recent surveys also show the increase of droughts frequency and intensity (Davies, 2015).

Climate Impact on Cambodian Fishing-Communities

Due to the livelihood of villagers around the Tonle Sap Lake that are predominantly based on fishing and agriculture, four main impacts are caused by climate change. This section mainly focuses on the impact of flooding and droughts which strongly correlates with climate change.

Income and Food-security: Communities around the Tonle Sap Lake mainly base their livelihoods primarily on fishing, rice cultivation, or both. Fish and rice are their main sources of income as well as their main source of nutrition. Thus, the impact of climate change to rice cultivation and fishing both affect the income and food-security of people in this region.

Flooding affects the irrigation system in the rice cultivation-centred villages by altering the timing of rice cultivation. In addition, there has also been a decrease in soil and water quality which affect the cultivation of rice fields (Nuorteva et al, 2010).

It also impacts the floating villages besides the Tonle Sap Lake and Mekong River by enlarging the fishing area leading to difficulty to catch fish. However, moderate flooding can also increase the number of fish flowing into the Tonle Sap River and can profit the villages with abundant catches. Flooding can also destroy some habitats for fishes caught in this area. Some shrubs and forests that are normally only temporarily flooded in the wet-season may become permanently flooded, thus limiting habitats for fish that live within these habitats.

However, the area would also face higher weather variation as shown in the climate scenario, that means extreme weather such as droughts would occur too for these communities. Droughts affect the rice cultivation-centred villages and fishing-based communities alike. The droughts directly affect the irrigation systems, and thus bring in less water to rice fields, affecting the overall production of rice. For the fishing communities, droughts result in an overall decrease in the number of fish available near the water of coastal villages (Nuorteva et al, 2010). Such variation in income sources makes the livelihood of these communities more vulnerable to weather effects and less predictable for long term planning and savings.

Housing/ Infrastructure: High floods can lead to destruction of fundamental infrastructures such as roads, houses, and other physical infrastructures. This also leads to flooding of houses. Radical floods cause more issues to poorer households because of their unstable structure of houses. The rural areas of Cambodia are also amongst the poorer regions, thus gaining more impact from flooding. Conversely, although the floating villages near the Tonle Sap Lake are poorer communities, their housings are adaptable to moderate floods compared to more affluent rice growing communities. However, when flooding became more radical, they were more affected by them due to weak structured housing (Nuorteva et al, 2010).

Diseases: Droughts lead to decrease of available drinking water and deteriorated water quality. Lack of drinking water leads to health crises such as malnutrition and decline in the immune system (Nuorteva et al, 2010). According to a research paper published in 2015, Diarrhoea is the second most common diagnosis and the second reason for death for children under five in Cambodia. This may be due to unsanitary conditions in rural Cambodia with about 66% of the rural population having no access to flushing toilets. Floods can strain these unstable sanitary conditions and thus impact the health of the rural population. Other diseases which may rise in number due to floods are, ear, nose and throat infections, wound infections, dermatitis and conjunctivitis (Davies, 2015).

Migration: As additional income, villagers also engage in short-term employment according to the location and work availability. Normally, these works for fishing communities include working for large-scale fishing companies whereas in agricultural communities, these work can include working for more large-scale, affluent farms.

Another short-term employment includes work in factories or nearby terms for a set period of time, as a form of temporary migration.(Nuorteva et al, 2010)

Climate Impact on Education in Rural Communities of Cambodia

Overall, indirect climate impact on Cambodian communities all lead to impact on education. With less income, children will be forced to work from a younger age, thus leading to increase in absenteeism and dropout rate. Lack of food will lead to low nutrition and thus, low concentration. With damages in housing and infrastructure, children may not be able to attend school because school facilities themselves may be damaged. Furthermore, destruction of public infrastructure such as roads will also become a hindrance for them to attend school. Like food security, diseases will also hinder children's education because they will not be able to take classes due to health issues. As for migration, if the children migrate with their parents, this will lead to change in schools and possible period when they are out of school. Changing school may mean change of curriculum, and a delay in education. If the children decide to stay in the villages while their parents migrate, it will increase the house chores for the children. This may lead to an increase in absenteeism.

Vietnam

Geography

Mountainous Vietnam is primarily in the Northern and Eastern part of the country. Unlike the southern parts of Vietnam, it faces colder and drier weather which pose different challenges. In line with current methodology on the impact of climate change on Vietnam, this report section will be using a localised vulnerability assessment to understand climate vulnerabilities faced by the different communities of Vietnam (Below et al., 2012, Deressa et al., 2009). This section will focus on key provinces that AEA has presence in, namely Lai Chau, Lao Cai and Hoa Binh provinces, located in the northern parts of Vietnam.

The climate of these provinces are characterised by temperate dry winters with hot summers. The dry cold climate lasts from October to March while the hot and rainy summer lasts from April to September. In the mountainous regions, temperature ranges from 18 °C to 28 °C and is influenced by the north-eastern monsoon of the East China Sea. However, unlike Lao Chau and Lao Cai, Hoa Binh is more low-lying and its temperature is similar to coastal provinces near the Red Delta. Its temperature varies between 20 °C and 22 °C. It also has hot and rainy summers instead.

Lao Cai has an estimated population of 701,706 people, followed by Lai Chau with 470,510 people, and Hoa Binh with a population of 854,131 people. Among the three, Lao Cai is the more diverse province, with 65.4% of its population being ethnic minorities in 2009. Many of these minorities stay in mountainous areas that require long commutes to cities.

Livelihood in Mountainous Vietnam

Many of these families in the North-eastern part of Vietnam are horticulture based or forestry based, and face an income lower than the average Vietnamese household. Agriculture activities account for 78.07% of these families' income. They are also the poorest households in the country according to the Vietnamese General Statistics Office in 2014.

Living in these mountainous terrain also affects their potential income. These are a result of poor land quality, uneven mountainous terrains, old-fashioned cultivation practices, lack of irrigation and poor transportation infrastructure. The problem is also perpetuated by an inability for intergenerational income transfer (Jamieson et al. 1998; SRD, 2011).

Education in Mountainous Vietnam

Currently, the education attainment in the mountainous region of Vietnam is low. A census in 2001 pointed to a 23.5% illiteracy rate among these labourers while more than 22.5% have no formal education level past primary school (Table 1). This problem still persists, with a 2018 voluntary national review on the implementation of the Sustainable Development Goal by the Vietnamese government highlighting that a key area of focus is children in rural, mountainous areas, because many of them have never still not attended school or have had to drop out.

TABLE 12. LITERACY AND EDUCATION RATES, 2001

Region	*% laboring population who is illiterate*	*% laboring population with no formal education level past primary*
All of Vietnam	3.8	16.7
North East	7.4	14.8
North West	23.5	22.5
Red River Delta	0.7	6.4
North Central Coast	2.3	10.4
South Central Coast	3.0	18.9
Central Highlands	5.6	17.4
South East	2.0	15.6
Mekong Delta	4.4	30.7

Source: GSO, 2005.

Table 1: Literacy & Education rates in Vietnam in 2001, Reference from General Statistics Office of Vietnam (2005) quoted from Vietnam's *Voluntary National Review of the Sustainable Development Goals Report* (2018)

Some of the challenges were identified in a 2016 UNICEF report on children in Lao Cai, where school and education scarcity, poverty and cultural beliefs act as barriers to a child's education if they are in a mountainous region.

UNICEF surveyed the number of schools available per commune (aggregated locations on a district level characterised by urban or rural). It found that in the city of Lao Cai schools and classes per commune of pre-school education are 1.7 and 15.7, respectively. However, for the mountainous region, there were only 1-1.2 schools and 10.6-15.0 classes for pre-school in Bac Ha, Bat Xat, Sapa and Van Ban districts. This is a low school available and is a consistent trend for all education levels as shown below. These statistics mean that high mountain terrain children must travel a long distance for formal education, mainly due to a lack of appropriate schooling infrastructure, that affects educational access of children.

Table 5.9.School allocation by education level

	Nursery education level					Primary education level					Lower-secondary education level					Upper-secondary education level					Resident density (persons /km2)
	# of school in a village	# of classes in a village	# of students in a class	# of teachers in a class	No of students per teacher	# of school in a village	# of classes in a village	# of students in a class	# of teachers in a class	No of students per teacher	# of school in a village	# of classes in a village	# of students in a class	# of teachers in a class	No of students per teacher	# of school in a village	# of classes in a village	# of students in a class	# of teachers in a class	No of students per teacher	
Overall	**1.2**	**14.3**	**21.9**	**1.7**	**13.2**	**1.5**	**24.0**	**18.6**	**1.5**	**12.6**	**1.1**	**9.6**	**29.5**	**2.2**	**13.1**	**0.2**	**3.1**	**33.7**	**2.4**	**14.2**	**104**
Lao Cai district	1.7	15.7	29.5	1.5	19.8	1.3	20.6	30.3	1.8	20.2	1.1	12.2	33.7	2.1	16.0	0.4	7.5	31.6	2.2	13.3	469
District																					
Bat Xat	1.0	15.0	17.8	1.4	12.5	1.0	22.7	16.9	1.4	11.5	0.9	7.9	30.3	2.2	13.5	0.1	1.7	34.3	2.9	14.4	71
Muong Khuong	1.3	16.1	20.6	1.7	12.3	1.4	27.2	15.9	1.4	10.9	1.2	9.7	27.5	2.2	12.6	0.2	2.6	32.9	2.4	13.3	102
Si Ma Cai	1.2	14.4	16.4	1.9	8.8	1.3	21.2	16.4	1.5	11.0	1.0	8.5	28.5	2.2	13.0	0.2	2.4	35.4	2.7	13.8	148
Bac Ha	1.0	10.6	23.3	1.8	13.0	1.3	20.7	17.1	1.5	11.7	1.1	7.4	28.5	2.2	13.0	0.1	2.0	37.7	2.9	15.3	87
Bao Thang	1.4	17.3	25.1	1.8	13.8	2.5	36.3	18.0	1.4	12.4	1.5	14.7	28.6	2.3	12.6	0.2	4.6	32.6	2.3	14.5	156
Bao Yen	1.3	16.9	20.2	1.6	12.9	1.7	26.1	17.7	1.5	11.9	1.4	10.4	28.1	2.3	12.1	0.2	3.3	33.6	2.3	14.7	98
Sa Pa	1.1	11.6	24.6	1.7	14.5	1.3	25.5	18.5	1.4	12.4	1.1	8.8	29.1	2.2	13.4	0.1	1.6	34.8	2.7	13.2	86
Van Ban	1.2	13.0	20.7	1.8	11.7	1.6	19.3	18.8	1.5	12.5	1.1	8.6	29.4	2.4	12.1	0.2	3.0	35.4	2.4	15.6	59

Source: Statistics Yearbook of Lao Cai 2015

Table 5.6. Size and development pace of Lao Cai nursery and secondaryeducation in 2014 vs 2009

	Northern Highland Area				Lào Cai				10 provinces			
	Number of school	Number of class	Number of teachers	Number of students	Number of school	Number of class	Number of teachers	Number of students	Number of school	Number of class	Number of teachers	Number of students
2014												
Pre-primary	2,889	26,309	41,717	672,913	208	1872	3343	42,971	1,512	14,487	20,645	328,127
Primary	3,077	52,934	72,170	1,042,096	243	4,270	5,498	69,964	20,525	35,893	48,108	653,136
LS	2,548	23,836	51,487	696,126	191	1,620	3,503	44,900	1,652	14,619	31,104	419,293
US	416	8,508	19,751	310,858	30	494	1,143	16,810	2,565	4,867	11,340	169,500
2009												
Pre-primary	2,435	22,149	27,922	476,100	184	1,562	2,115	31,300	1,339	12,789	15,687	263,300
Primary	2,986	51,473	66,456	933,675	236	3,897	4,760	61,298	1,964	35,381	43,905	586,062
LS	2,467	24,852	53,199	721,608	187	1,577	3,483	45,997	15,855	15,121	32,066	428,237
US	406	8,536	19,656	346,627	26	427	1,011	15,826	2,345	4,693	11,043	181,501
2014/2009 (%) growth												
Pre-primary	118.64	118.78	149.41	141.34	113.04	119.85	158.06	137.29	112.92	113.28	131.61	124.62
Primary	103.05	102.84	108.60	111.61	102.75	109.57	115.50	114.14	104.51	101.45	109.57	111.44
LS	103.28	95.91	96.78	96.47	102.14	102.73	100.57	97.62	104.19	96.68	97.00	97.91
US	102.46	99.67	100.48	89.68	113.46	115.69	113.06	106.22	109.38	103.71	102.69	93.39

Source: Annual Statistical year book 2014, GSO

Table 2 & 3: School Allocation by education level in Lao Cai and Size of Lao Cai education institutions, Reference from General Statistics Office of Vietnam (2014) quoted from UNICEF's *Report on Situation Analysis of Children in Lao Cai* (2016)

The problem is also made worse by the availability of teachers. The UNICEF report finds that these schools in mountainous regions are catered mostly to ethnic minorities but there is a lack of indigenous teachers who can bridge the language and cultural gap for minority children, which in turn affects their comprehension of other subjects in Vietnamese. This is partly due to the lack of teacher incentive. In Lao Cai, no allowances are given for teachers teaching at mountainous and remote branch schools and no allowances for staying in remote villages. They are also not compensated for the village visit they do to encourage children to go to school. These, in turn, led to poor attendance rate and quality of education in these highland and remote areas of Lao Cai.

Beyond the education quality, the UNICEF report found economic and cultural barriers among rural poor households in the Lao Cai region.

The report found that currently children in families with economic difficulties and poverty already face pressure to work for the family. The problem is nationwide, with a National Survey on Child Labour in 2012, conducted by VIetnams' Ministry of Labour - Invalids and Social Affairs, General Statistics Office Of Vietnam and International Labour Organisation, revealed that 1.75 million children, or 9.6% of children aged 5-17 in Vietnam are categorised as economic child labour. When non-economic activities are accounted for, the 2014 UNICEF and General Statistics Office Of Vietnam's study is more telling, showing that 16.4% of these children participate in economic activities or housework for prolonged periods. This pressure to work becomes reinforced in children, such that UNICEF reported a survey where children feel ashamed of attending school at a higher age because of the economic tradeoff it entails for the family.

Other cultural and social barriers were also discussed in the UNICEF report that includes an unwillingness of children to go to school because the child or parents think that schooling is meaningless; or the concept of the male heir of some ethnic minority groups, which lead to girls not being sent to schools.

These barriers from both the family and the school side thus deter educational attainment of children in the mountainous areas of Vietnam.

Climate Impact in Mountainous Vietnam

According to the German Watch Organization (2018), Vietnam ranked eighth in the list of the ten “most vulnerable countries to climate change” from 1998-2017. It experienced a total of 220 natural disasters in the last twenty years, including typhoons, cyclones, tropical depressions, floods, landslides and drought. Considering only in the Northern mountainous areas, provinces such as Son La, Lai Chau, Lao Cai and Dien Bien are most vulnerable to weather fluctuation, temperature increase and natural disasters.

There will be increased temperature fluctuations, with colder winters and hotter and more humid summers in the mountainous regions of Vietnam. Taking the results of monitoring stations around Vietnam, Tuong and Nguyen (2020) noted that there is an increasing temperature over the past three decades, with the average temperature increasing by 0.42°C since. In the mountainous region, the temperature increase was more significant, with an increase of 1.8-2.0°C between 1985 and 2014. During the winter period, however, the cold weather has been deteriorating. In 2015-2016, the temperature in the Northern mountainous provinces fell below -5°C, a record low freezing temperature over the previous 30 years. The 38 days cold wave eventually resulted in an estimated crop and livestock loss of USD$30 million for the locals. Currently, the situation is already quite bad, with the Sapa monitoring station in Lao Cai registering a low average temperature of 9.2°C, lower than the usual 18-22°C with the lowest temperature recorded at 0.5°C in January 2018 (Figure 5).

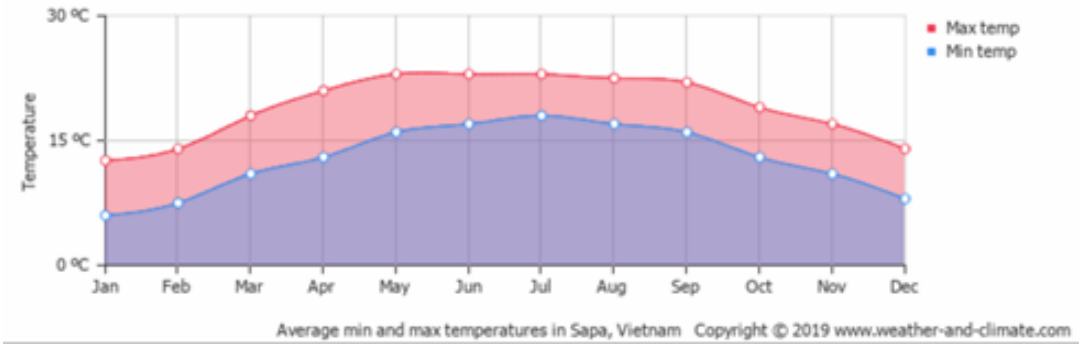


Figure 5: Temperature variation in Sapa, Vietnam, 2018, Reference from www.weather-and-climate.com on Vietnam (2019)

According to the Ministry of Natural Resource and Environment (MONRE) of Vietnam models (based on IPCC’s 4th Report on emission scenario, with 1980-1999 as baseline), it is forecasted that temperature in Vietnam will rise 0.7°C in the next 10 years on average relative to the average of 1980–99. The rise would increase faster in the Northern and Northern central of Vietnam, including the mountainous terrain with temperature increases of 1.6°C to 2.8°C (Table 4).

TABLE 4. PROJECTED CHANGES IN ANNUAL MEAN TEMPERATURE (°C) RELATIVE TO THE 1980–99 PERIOD, MEDIUM EMISSION SCENARIO (B2)

	Decades in the 21st century								
Climatic region	*2020*	*2030*	*2040*	*2050*	*2060*	*2070*	*2080*	*2090*	*2100*
North West	0.5	0.7	1.0	1.3	1.6	1.9	2.1	2.4	2.6
North East	0.5	0.7	1.0	1.2	1.6	1.8	2.1	2.3	2.5
North Delta	0.5	0.7	0.9	1.2	1.5	1.8	2.0	2.2	2.4
North Central	0.5	0.8	1.1	1.5	1.8	2.1	2.4	2.6	2.8
South Central	0.4	0.5	0.7	0.9	1.2	1.4	1.6	1.8	1.9
Central Highlands	0.3	0.5	0.6	0.8	1.0	1.2	1.4	1.5	1.6
South	0.4	0.6	0.8	1.0	1.3	1.6	1.8	1.9	2.0

Source: MONRE 2009.

Table 4: Projected changes in annual temperature in Vietnam, Reference from MONRE, 2009, quoted from Vietnam's *Voluntary National Review of the Sustainable Development Goals Report* (2018)

Climate change will also increase weather fluctuation in Vietnam. Comparing data from the MONRE of Vietnam in 2016, Tuong and Nguyen (2020) find that mountainous regions in Vietnam are already facing erratic rainfall. There are longer and more frequent rains that can cause widespread inundation, flash floods and landslides in the mountainous regions. MONRE of Vietnam predict that the rainfall will increase by around 50% in the next 10 years and exponentially over the next decade (Table 5). Specifically, In the province of Hoa Binh, Huu Trung (2016) found that the recent heavy seasonal rainfall and steep slopes gave rise to more river flooding, flash floods, and landslides that have dealt severe damage to the province.

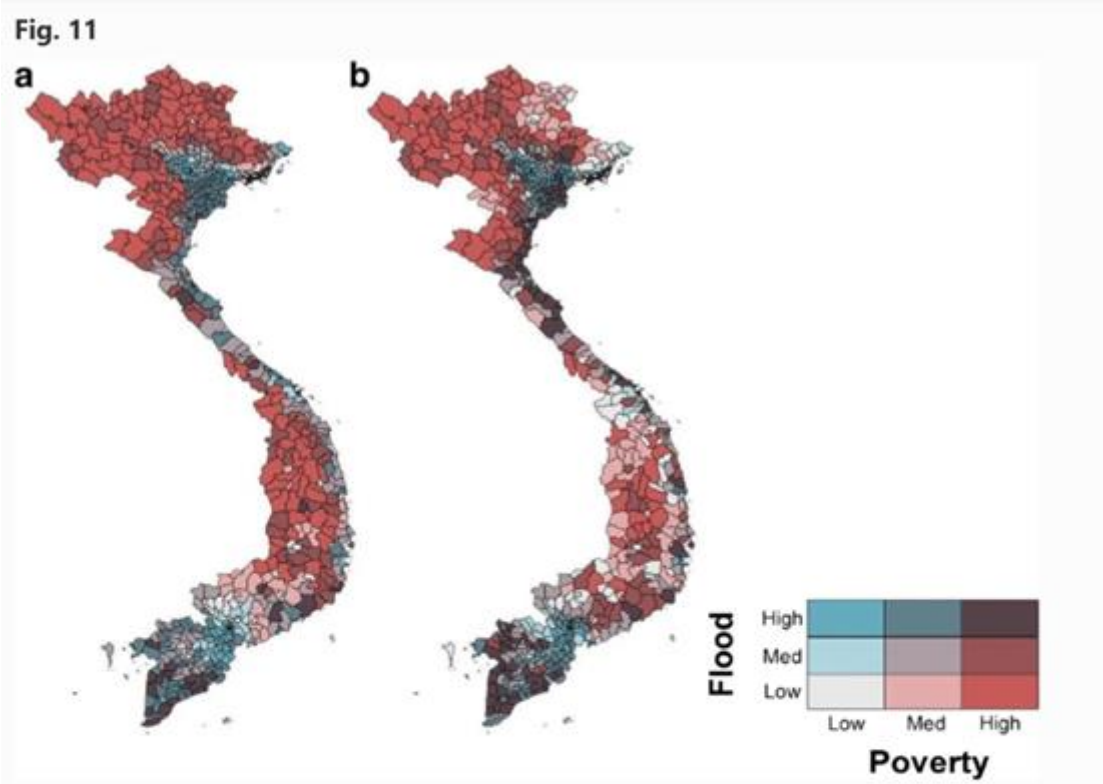
It is forecasted by MONRE that this issue will only persist and communities are more vulnerable to such weather fluctuations. To see the exact impact in each district, we can refer to the mapping done by Bangalore, Smith & Veldkamp (2018) (Figure 6). Areas of the Northern Mountains including Lao Cai, Lai Chau, exhibit medium probability of flood on its poor communities (darker shade of brown) while areas near Hoa Binh not only face flash floods due to the rainfall but also flooding from sea water rise at the Red River Delta.

TABLE 5. CHANGES IN ANNUAL RAINFALL (%) RELATIVE TO 1980–99 PERIOD, MEDIUM EMISSION SCENARIO (B2)

	Decades in the 21 century								
Climatic region	*2020*	*2030*	*2040*	*2050*	*2060*	*2070*	*2080*	*2090*	*2100*
North West	1.4	2.1	3.0	3.8	4.6	5.4	6.1	6.7	7.4
North East	1.4	2.1	3.0	3.8	4.7	5.4	6.1	6.8	7.3
North Delta	1.6	2.3	3.2	4.1	5.0	5.9	6.6	7.3	7.9
North Central	1.5	2.2	3.1	4.0	4.9	5.7	6.4	7.1	7.7
South Central	0.7	1.0	1.3	1.7	2.1	2.4	2.7	3.0	3.2
Central Highlands	0.3	0.4	0.5	0.7	0.9	1.0	1.2	1.3	1.4
South	0.3	0.4	0.6	0.8	1.0	1.1	1.2	1.4	1.5

Source: MONRE, 2009.

Table 5: Projected changes in annual rainfall in Vietnam, Reference from MONRE, 2009, quoted from Vietnam's *Voluntary National Review of the Sustainable Development Goals Report* (2018)



Overlay of poverty and flood at the district level for the 25 year-return period flood with climate change. Map A shows relative exposure, overlaying the percent of poor and percent of population flooded, Map B shows the absolute exposure, overlaying the # of poor and # of population flooded. Bins: Map A, Poor, Relative (Low = 0–15%, Med = 15–28%, High = 28%+). Bins: Map A, Flood Exposure, Relative (Low = 0–26%, Med =26–47%, High =47%+). Bins: Map B, Poor, Absolute (Low = 0–15,900, Med =15,900 – 31,000, High = 31,000+). Bins: Map B, Flood Exposure, Absolute (Low = 0–27,000, Med =27,000 – 70,000, High = 70,000+)

Figure 6: Flooding impact by region,, Reference from Bangalore, Smith & Veldkamp (2018), Exposure to Floods, Climate Change, and Poverty in Vietnam

Climate Impact on Mountainous Communities in Vietnam

From the above climate change impact and the challenges faced by schools, we have identified 4 effects climate change has on the Vietnamese community, namely a poverty effect, a migratory effect, and a health effect.

Poverty: The horticulture families in Vietnam would face a deteriorating environment for their crops. Nguyen, Yao & Shah (2019) did a Ricardian regression analysis of 1055 farm households from the 2012 Vietnam Household Living Standards Surveys in North Western, Vietnam. Comparing against the income of these households, they find that low dry season temperatures are detrimental to crop production and animal growth, inevitably affecting the living standards of farmers. This may contradict earlier studies which modelled increased rain could marginally benefit crop production in higher altitude levels (Pham, 2012). However, given the 2015-2016 frost with such detrimental effect, it is more likely that the fluctuations would do more harm than good to crop production in the region according to the

aforementioned 2019 study. For the households, Nguyen, Yao & Shah (2019) estimate a net income loss of VND$2.82m to VND$2.325m annually in 2050 due climate fluctuations, adversely affecting the communities' income.

In terms of flash floods, Nguyen, Yao & Shah (2019) find the agricultural impact is great, with a reduction of 5% in rice yields for the same crops during the spring season, a result in line with Schad et al's finding back in 2011. In the province of Hoa Binh, they would face soil runoff of 23 to 52 ton/ha per year due to climate change, affecting the crop yield for the communities (Ngo & Nguyen, 2020). Bui et al. (2014) modelled specifically the effect of flood in Vietnam and found a potentially 6.9 per cent and 7.1 per cent decline in household per capita income and expenditure, respectively.

With climate change affecting rice production, it modifies the economic opportunities available to these communities, including their farm income, while also increasing the cost of food, and hence cost of living, for consumers.

Migration: This reduction in rice production is not limited to the mountainous community but the whole of Vietnam. On a macroeconomic perspective, the lowered output results in lower labour demand in rice production, causing increased unemployment and lower wages that will push communities to migrate (Baronchelli & Ricciuti, 2018). Chun & Sang (2012) came to a similar conclusion, that the main drivers of migration in rural Vietnam are primarily a lack of steady employment and poor economic opportunity in migrant origin areas.

Another form of migration is environmental migration, or a need to relocate due to environmental dangers. Unlike the economic migration, these climate migrants in Vietnam tend to be permanent moves that include their family and children when we consider the flooding that frequent in Southern Vietnam near the Mekong delta (Berlemann & Tran, 2020). Given the flash flood vulnerability faced by mountainous areas of Vietnam, the potential for such migration cannot be ruled out, where migrants perceive their living environment inhabitable and choose to migrate (Koubi et al, 2016).

Currently, there is a net out-migration in these Northern Midland & Mountainous areas from 2005 to 2014 (Table 6). Given the above factors, migration is anticipated to increase.

Table 2.3. Migration of the Northern Midland and Mountainous area and Lao Cai

	In-migration rate			Out-migration rate			Net-migration rate		
	2005	2009	Preliminary for 2014	2005	2009	Preliminary for 2014	2005	2009	Preliminary for 2014
Whole country	**5.0**	**8.7**	**9.2**	**5.0**	**8.7**	**9.2**	...	...	...
Northern Midland and Mountainous area	1.9	1.8	2.3	2.3	5.4	4.3	-0.4	-3.6	-2.0
Lao Cai	1.2	3.9	2.0	2.4	4.5	4.1	-1.2	-0.6	-2.0

Source: GSO

Table 6: Current migration situation in Lao Cai, Reference from General Statistics Office of Vietnam, quoted from UNICEF's *Report on Situation Analysis of Children in Lao Cai* (2016)

With these migrations, there are mixed effects to the migrant communities. In a 2014 UN report on migration and climate change in Vietnam, many of these migrants are relatively young,

unmarried, and single, with many of them women due to the high demand for female workers in industrial zones. They move to urban areas where they enjoy better economic opportunities, but they are also made more vulnerable because of a lack of access to livelihoods and poor sanitary environments. These factors may lead to urban poverty that worsens the conditions faced by these migrants. Approximately one third of households reported improved incomes and health outcomes after relocation but 40% households reported reduced incomes.

In the case of migration with children, the UN report on Vietnam highlighted the potential issues children face such as fragmentation of their families, interruption of their education and disruption of social networks. If households face reduced income, children may still be forced into child labour alternative where boys would be thrust into physically demanding sectors such as coal picking or fishing, while girls often do domestic work.

Health: Using panel data from rural Vietnam and rainfall data in an instrumental variable approach, Lohmann and Lechtenfeld (2015) find that in the year of droughts, the community faces an increased risk of illness. Drought-related health shocks also cause financial burden for many households, with health expenditures increasing by 9-17 percent of total consumption.

Many ethnic minorities also face great difficulty in medical access where difficult terrain of forests, mountains, and roads hinder the route to medical facilities. With landslides and increased rains, this would create additional challenges to medical access for these mountainous families.

Gender: Depending on the community's belief and biases, groups of individuals may be more vulnerable than others with climate change and one of such groups are the women and girls. According to a UNDP desk study in 2009 on gender and climate change in Vietnam, it notes that women are greatly disadvantaged. They take on more agricultural labour work, face increased responsibility in water collection while facing a lower likelihood of land tenure titleship as a result of the climate effect.

Furthermore, in the face of disasters, females have lower adaptation ability. Unlike their male counterparts, females in a family do not get warned about climate alarms. They are also given less opportunity to learn to swim due to social customs and beliefs (Oxfam, 2008). These unequal opportunities and inequality ultimately limits the possible range of responses for adaptation by women, making them more vulnerable within the community (Lambrou & Piana, 2006).

Climate Impact on Education in Mountainous Vietnam

With the above analysis on Vietnam, there will be 2 observable factors where climate change would have an indirect effect on education attainment in Vietnam for children.

Reduced education access: Faced with increased poverty, there is added economic pressure for households in mountainous Vietnam to withdraw students from school. The family and the child may choose to work rather than study given the preexisting pressure socially and economically. This translates to a worsening of school attendance and education

attainment for these children. These decisions may be felt more keenly among girls given their vulnerability within the community.

With the flash floods, cold weather and natural disasters that befall on these regions of Vietnam, climate change will also present obstacles that endanger the already long commute to school and pull students away from formal education. It is already a common practice that in very cold weather with frost and ice, preschool and primary students will be off-school to avoid the cold if the temperature is below 10°C, and lower-secondary students will be off-school if the temperature is below 7°C. However, with climate change, the frequency of low temperature in mountainous areas of Vietnam would increase and reduce the education access and delaying school programme for these children.

Poor educational performance: Even if families send students to schools, the quality of education would be affected by climate change. Several factors already plague the schooling quality in mountainous Vietnam, from a lack of schools and teachers, to a lack of further education. It would be further put to the test with the effect of climate change and the issues would surface more prominently if little action seeks to address this systemic problem.

Furthermore, with communities choosing to migrate, it has a mixed effect on the children. In the 2014 UN report, climate migrant children reported greater access to education facilities when they migrate, often to cities. However, the environment they face creates a new set of challenges that will pull children away from schools.

If schooling students stay in the mountainous region of Vietnam, they face the health issues climate change would bring along to these communities. Issues from illnesses and poor sanitation would affect the quality of education children can receive from schools. Without proper access to medical care or without treating the underlying causes of illnesses, the problem will persist to affect student’s performance in schools.

Laos PDR

Geography

Laos is a country with a 7.25m population. It is sparsely populated, having 32 people per km^2. 64.36% of these individuals or slightly above 4.61m people still live in rural areas.

Geographically, Laos is largely mountainous on its borders but flat land in the Southern part of the country. Its lands are well-suited for paddy rice cultivation and rearing of livestocks. Most of the western border is demarcated by the Mekong River, an important route for transportation and communication. The eastern border shared with Vietnam is characterised by mountains sparsely populated by tribal minorities with limited contact to lowland Laos

It is surrounded by Burma, Cambodia, China, Thailand, and Vietnam, making it an ideal crossroad for migrants.

Currently, AEA has a presence in Vientiane and Oudomxay province. Both provinces are in the northern part of Laos. Vientiane is near the capital Vientiane and is characterised by low-lying land. Oudomxay, on the other hand, is in the north-western region and has a higher altitude as compared to Vientiane. Both provinces are near the Mekong river

Livelihood in Laos PDR

Agriculture and forestry accounts for 47% of Laos GDP in 2019 while providing for 61.67% of the total employment in the country. The majority of agricultural fields are concentrated along the Mekong River and its tributaries.

For Vientiane province, the main source of income is still agriculture, with the province being one of six major rice producing plains in Laos. This is followed by mineral extraction such as salt, crafts and tailoring and carpentry. For Oudomxay province, the main source of income is subsistence farming such as sugarcane and corn, followed by mineral extraction.

This reliance on agriculture will continue and a shift in sector is not expected in the general landscape of Laos. In a 2019 World Bank report, the predominantly agricultural country is reported to have experienced a 7.3% annual growth for the past two decades. This is driven by increasing farm incomes as the country is commercialising its farming industry, moving away from subsistence rice cultivation to cash crop since 2013. This reliance on agriculture is hence predicted to continue given the favourable growth it is experiencing.

However, simultaneously, there is an increasing number of unemployed seasonal workers who have been displaced by such industrialization. In the same report, the World Bank estimates an increasing unemployment in rural Laos, from 4.1% in 2013 to 15.7% in 2019.

To make up for the non-farm income, there is an increasing number of migrations. This alternative income source is increasingly important for rural households, with remittance accounting for 15% of a household's annual income (World Bank, 2019) as compared to 7% in 2008 (Manivong, 2014). The migration route differs, depending on the geographical location of the workers. Northern Laotians would migrate typically to urban areas or the capital while others choose to migrate internationally to countries like Thailand.

Education in Laos PDR

In 2017, Laos has a primary school enrollment of 98.7%. However, of these individuals, only 81.9% complete their primary school education (UNICEF, 2017). The low completion rate was also echoed in a 2016 World Bank report on Reducing Early Grade Dropout and Low Learning Achievement in Laos PDR, with many dropping out before completing their primary education (Figure 7). It attributes these high drop-out rates and low attendance among children to supply-side constraints and demand factors.

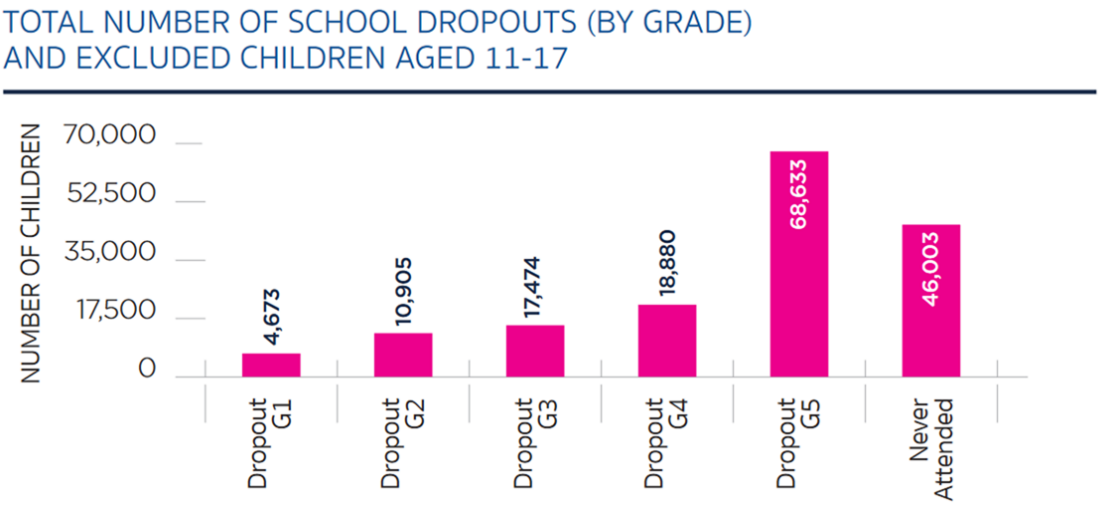


Figure 7: Total number of school dropouts by grade, Reference from World Bank (2016), Reducing Early Grade Drop Out And Low Learning Achievement In Lao PDR Report

The World Bank Report finds that the environment of Laos Schools can deter students from schools. These environmental factors include a lack of basic infrastructure such as roads and reliable transportation and an insufficient number of teachers and resources for these schools (Figure 8). These translate to an educational capacity in certain regions of Laos, with schools offering education until the third or fourth grade only because of the constraints they face.

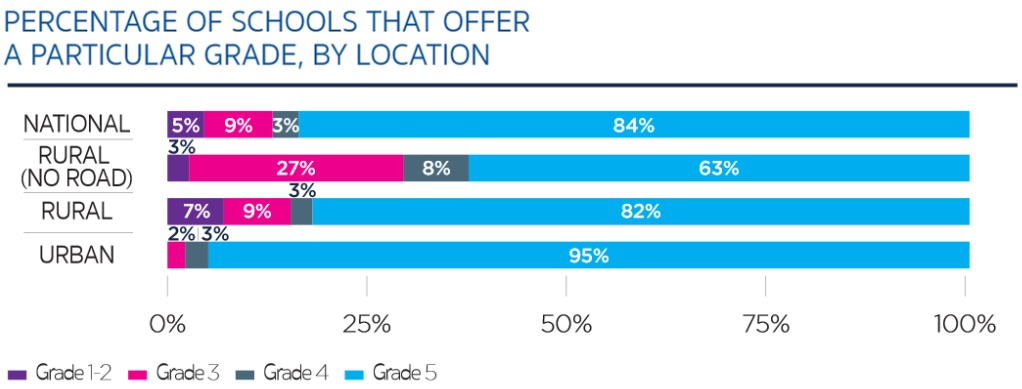
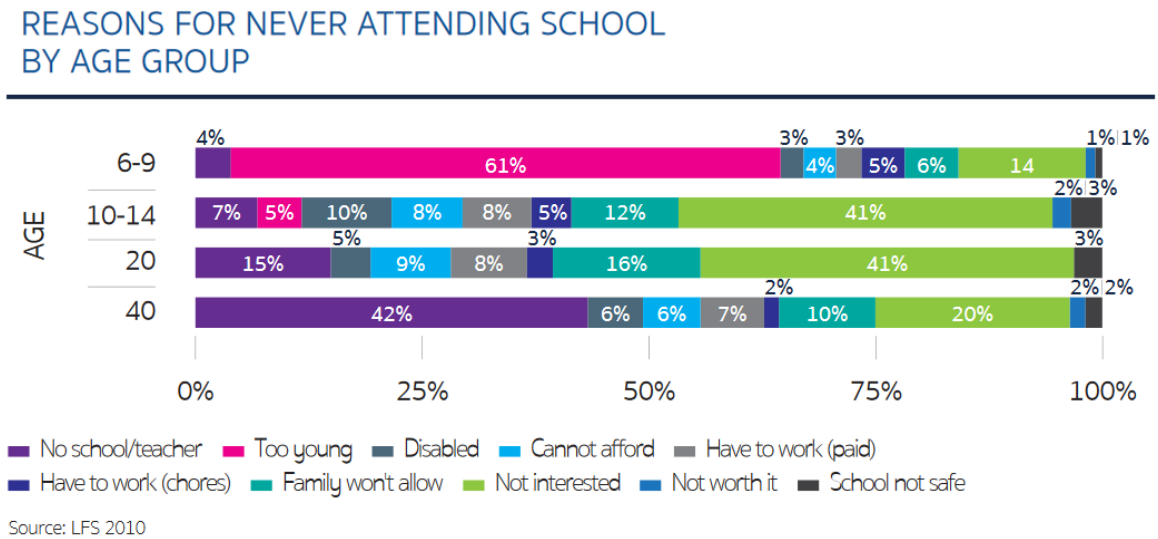
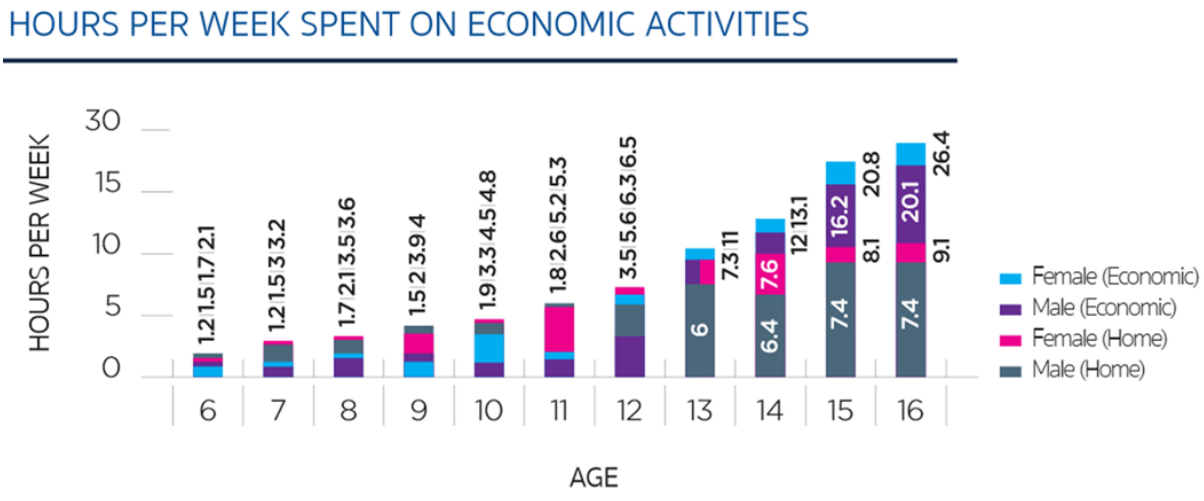


Figure 8: School grade availability by location, Reference from World Bank (2016), Reducing Early Grade Drop Out And Low Learning Achievement In Lao PDR Report

Students living in poor rural regions of Laos also face demand constraint when it comes to education. These arise from household decisions to stop schooling due to factors such as a low perception of the benefits of schools and direct and indirect cost of education. Citing a survey by LFS in 2010, the World Bank showed that the majority of the reasons for not attending school is due to beliefs. Older Laotian believed children of age 6 to 9 are too young for formal education, which explains the high proportion (70%) of children not receiving early childhood education (Figure 9) (UNICEF, 2017). For older children, they cited a general disinterest in education possibly fueled by the low returns from education of 3-4% more wages for each additional year of schooling in Laos (Montenegro and Patrinos, 2014). Another observation is the 33% of children aged 10 to 14 who cited the high direct and indirect cost of education. The direct cost includes spending on uniforms and meals and transportation while the indirect cost includes paid and unpaid work. This high opportunity cost would also rise as children get older, with children aged 10 spending 4.5 to 4.8 hours per week on such work while children aged 16 spend 20.1 to 26.4 hours per week, with a substantial proportion of time spent on paid labour (Figure 10). These suggest that children are required to contribute their labour to the family on top of time spent on education



Source: LFS 2010



Source: LECS 2012, 2013

Figure 9 & 10: School attendance by age group and children involvement in economic activities by gender, Reference from World Bank (2016), Reducing Early Grade Drop Out And Low Learning Achievement In Lao PDR Report

On top of the challenging environment of school retention, Laos students will also have differing quality of education. A study in 2013 found several factors are associated with learning outcome and chiefly, the socioeconomic status and ethnicity are a strong determinant on test score performance among Laos students. Of which, the underlying factor from such status differences is the nutritional intake of these children, with stunted and wasted children faring badly in comparison to healthier Laotian children.

These studies hence point to several key factors that currently challenge the education of Laos students. These are namely the infrastructures of schools, the perceived value of education, its direct and indirect cost and the nutritional status of students that affect the quantity and quality of education they receive.

Climate Impact in Laos PDR

Currently, IPCC global climate change models forecast an average annual temperature worldwide to rise 2 degrees celsius by 2050. As a result of the high temperature, Joffre (2014) projected that many crops such as rubber and robusta coffee would shift to higher altitude areas while lower lying areas would no longer be suitable to grow these crops. Maize yield projections also show a general decrease across the basin, with Gia Lia (-12%), Mondulkiri (-6%), Kampong Thom (-6%) provinces being the most severely affected of the hot spot areas. The report, however, pointed out that climate change would not affect the suitability of lowland rain-fed rice although other indirect effects of decreased water availability and increased temperature and the salinity intrusion of the delta would still affect farmer's ability to grow these crops. These would still translate to a 4 to 4.2% fall in yield (Trisurat et al, 2017). This means that cash crops would be less than suitable to grow in Laos, reversing the original cash crop shift and hence affecting the cropping patterns of farmers. It would also affect the income streams of these individuals.

The climate impact would also lead to more weather fluctuation. Between 1970 and 2010, Laos has experienced 15 floods primarily along the Mekong River while in the same period, 5 droughts have affected 188,000 households. In a 2019 World Bank report, a Coupled Model Intercomparison Project Phase 5 (CMIP5) model forecast that traditionally hot seasons will face higher temperatures while the rainy season will worsen as precipitation is expected to fluctuate. The traditionally hot season between April to October (Figure 11) would face a higher-than-normal increase in temperature in the next 10 years (Figure 12 & 13). Similarly, rainy seasons from May to September would potentially face higher fluctuations in rainfall. These fluctuations would lead to increased flooding and drought that would disrupt the lives of Laotians, especially those living in the province of Vientiane who experience higher rainfall than other provinces, evident in an Asian Disaster Preparedness Center report in 2008 (Figure 14 & 15).

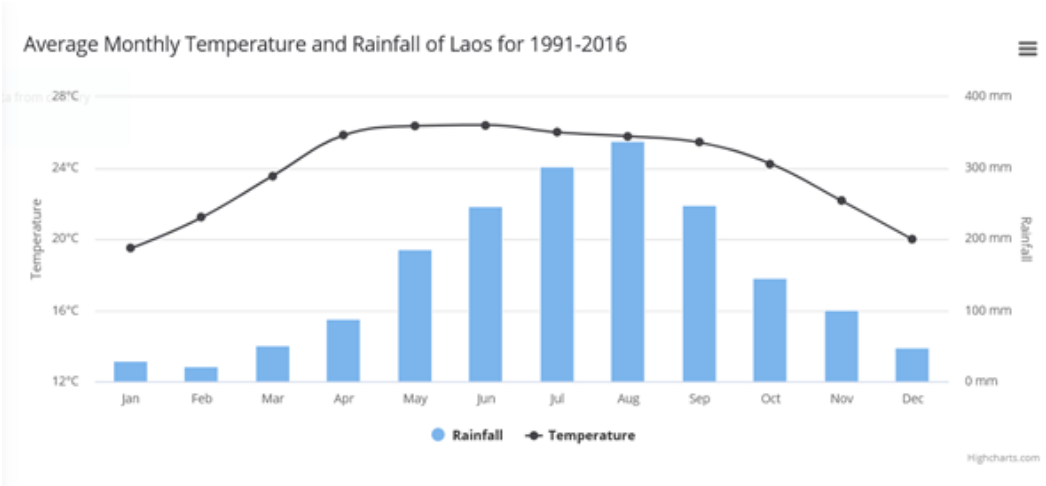
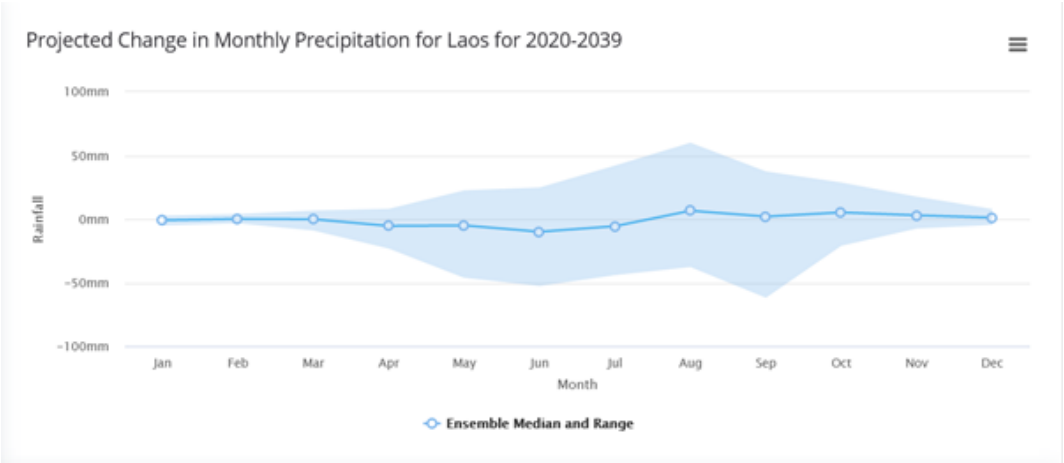


Figure 11: Historic average monthly temperature & rainfall in Laos, Reference from World Bank (2019), Climate Change Knowledge Portal Country Laos Report



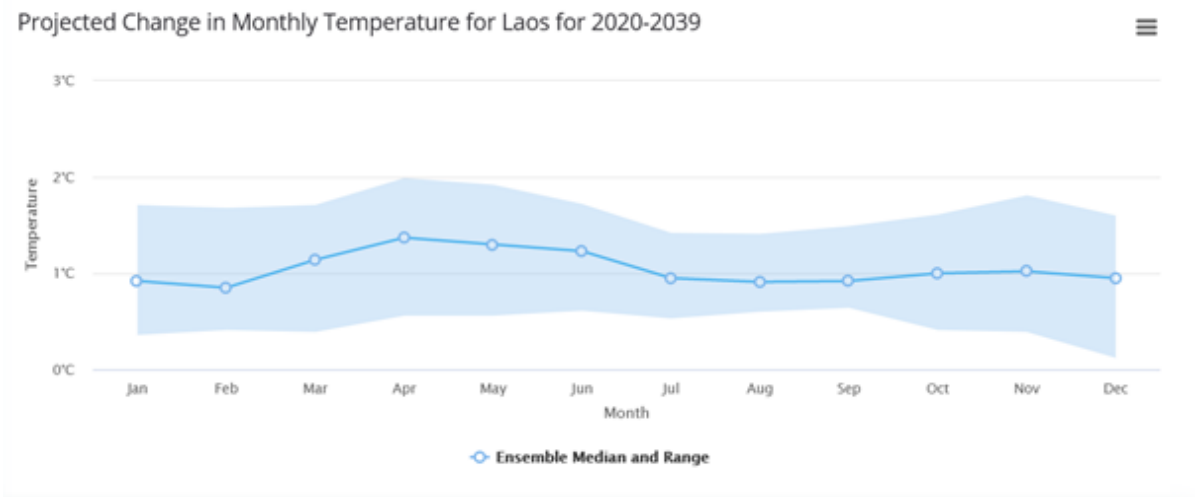


Figure 12 & 13: Projected change in monthly precipitation and temperature in Laos, Reference from World Bank (2019), Climate Change Knowledge Portal Country Laos Report

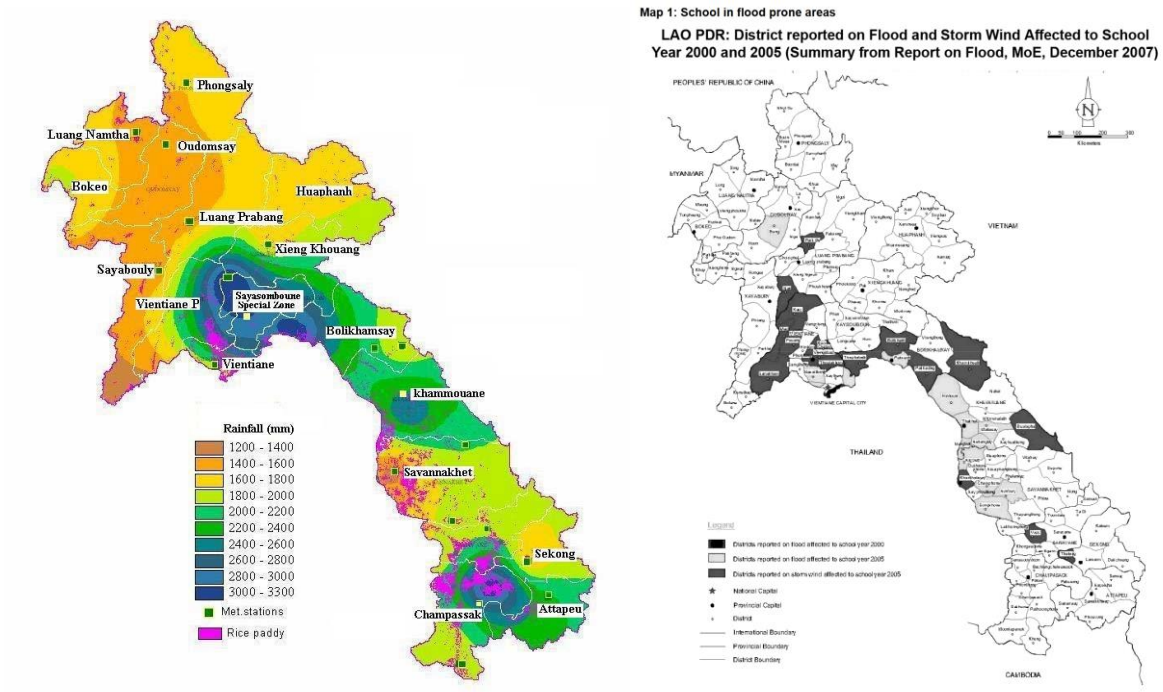


Figure 14 & 15: Historic rainfall map of Laos and past Flooding in Laos PDR, Reference from Asian Disaster Preparedness Center (2008) Study on impacts of disasters on the education sector in Lao PDR

Given the mountainous geography of Oudomxay, these climate change effects would lead to knock-on effects of landslides. With the increased wet seasons and heightened precipitation from climate change, it heightens the risk of landslides where the loosened sediments would trigger landslides, of which a substantial number is attributable to the rainfall from climate change (Wu et al, 2015). The UN development programme quantified the climate risk of landslides to be a mid-range 5.24% in Laos for low-lying areas (UNESCO Bangkok, 2015). These would result in temporary blockages to short sections of road and give rise to several hours of delay to traffic. It would also require ongoing investment in debris clearance, repairs towalls and roadside drains and road pavement (Haem, 2008). For the Laotians living nearby, the increased possibility of landslides would pose a threat to their livelihood.

The increased climate change effect, in recent time, has led to a triple storm in 2018. The storm Son-Tinh, breached the Xe pien-Xe Nam Noy hydropower saddle dam and caused flash flooding, which was subsequently followed by the storm Bebinca. Over 600,000 people in 90 districts were affected by the events, and the damages and losses reached US$ 371.1 million. The agriculture sector suffered 57% of the total loss with an overall industry growth stunted by 3.7%. On the social aspect, 14.2% of the rural population were estimated to suffer from the disaster-related food insecurity, and 70% of the indebted households were forced to increase their loans to secure their production. It also caused an outbreak of diarrheal diseases, respiratory infections, dengue and typhoid fever as well as skin diseases in many of the affected regions. In response, there was an increased migration, domestically and internationally to cope with the economic losses caused by the 3 storms of 2018 (Government of Lao PDR, 2018). This is anticipated to increase as weather fluctuation persists in the region.

Climate Impact on Laotian Community

From the above climate change impact and the challenges faced by schools, there are 4 identified effects climate change has on the Laos community, namely a poverty effect, a migratory effect, a food security problem and a health effect.

Poverty: Directly, climate change would affect the livelihood of Laotians through the economic dislocation caused (Akresh, 2016). Farmers of these rain-fed rice typically sow their rice at the start of the rainy season typically in May and harvest them in October or November after the end of the rainy season. A mid-season dry spell after sowing would damage the young rice plants or impose additional cost on farmers to obtain water for rice plant sustenance while waiting for the rain to resume. If the dry spell is prolonged, it would be too late to replant the rice to maturity before the end of the rainy season. Floods would also affect the cultivation because these typically coincide with the middle to end of crop season for farmers. These flooding damage rice production and recovery would be difficult since it would be too late for replanting (Leary, 2007, Barbier, 2015). This economic dislocation would directly affect the agricultural income of Laotian households and increase poverty in the region.

Migration: Climate change would also push Laotian to migrate, internally or externally. In order to mitigate the poverty effect, a common strategy among Laotian households is to pursue non-agricultural income or migration remittance (Martin & Lorenzen, 2016). These alternative sources of income provide relatively better income (Reardon et al., 2000). acts as a form of insurance against the risks of farming (Lohmann and Liefner, 2009, Rigg, 2006). However, this is not a strategy many households in Laos can adopt (Figure 16). Furthermore, for the fortunate households in Laos that can migrate, their options are limited to lower-paid employment either in urban Laos or in relatively easy-access Thailand because of the lack of alternative livelihood options (SERC 2008; Baker 2015, Martin & Lorenzen, 2016). Currently, there is a substantial migrant situation with 17% of the total population being internal urban-rural migrants while 18% reside abroad (Lao Statistics Bureau, 2016, UNDESA, 2017). Of these migrants, most cited employment opportunities as their primary motivation for migration (28%), followed by “family” (18.3%) and access to educational facilities for themselves or family members (14.9%) (Lao Statistics Bureau 2016). With the effect of climate change, it would provide an additional economic push factor for the Laotian community to migrate.

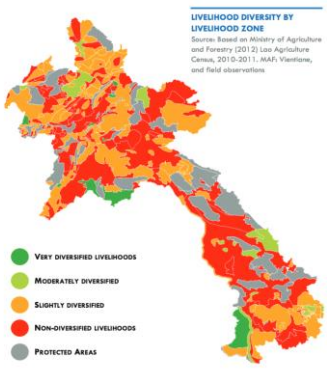


Figure 4. Livelihood diversity by livelihood zone (Ministry of Natural Resources and Environment & WFP, 2016)

Figure 16: Map of livelihood diversification in Laos, Reference from Sarah M Martin, Kai Lorenzen (2016) Livelihood Diversification in Rural Laos

Food Security: Climate change would reduce the agricultural output of rural poor Laos

households which can be used for subsistence. Currently, Laos PDR is domestically dependent on its food production. A macro-micro analysis done by Kyophilavong & Takamatsu (2011) found that Laotian households are not sensitive to the price fluctuation of rice prices, where a 15% hike in price and 10% fall in agricultural output would lead to a less than 3% fall in purchasing power of a households instead of any increase. This suggests a strong reliance on domestic subsistence production at that point of analysis.

The current trend of agricultural industrialisation already impacts rural families where farmers are displaced to become informal seasonal farming workers. The movement away from subsistence crops also reduces food supply or heightens domestic food prices, affecting the food availability in Laos. Currently, Laos is already experiencing prolonged shortfalls of rice production annually. An estimated 46% of the rural populations are already at risk of facing food insecurity (CCAFS, 2019).

When coupled with the climate impact, where the farming environment becomes less desirable due to drought on the already steep topography and sandy soils, domestic production would be unable to meet domestic consumption (Trisurat et al, 2017). It is estimated that climate change would have a direct effect of lower calorie intake of 6% by 2050 and exacerbated to 14% by 2080 (Havlik et al, 2015). It would affect the nutritional intake of the community, including students, and families would have to make trade offs because of food rationing.

Health: With more extreme temperatures and increased flooding, the health of the community will be affected. Water-borne diseases such as dengue and malaria would thrive in longer rain-spells (Caminade. 2013). This is on top of the prevalence of acute diarrheal diseases, respiratory infections, dengue fever etc where it affects an estimated 595 per 100,000 people in Laos (Law, et al., 2015).

The impact of these diseases were modelled by Davies et al (2015) on the neighboring Cambodia based along the Mekong Basin where a significant number of floods were also recorded. They found that these increased floods were associated with diarrhoeal disease in two provinces and were compounded by other factors such as poverty, malnutrition, agricultural dependency and public health and sanitation. Given the low adaptive nature of Laos, a similar problem may threaten the health of the community. Other threats to health would also include undernutrition, particularly on a child's health (Phalkey et al, 2015), and pathogens among livestocks given the rise in temperature and wetter periods (Joffre, 2014).

Climate Impact on Education in Laos PDR

With the above analysis on Laos, there will be 3 observable factors where climate change would have an indirect effect on education attainment in Laos for young children.

Increased poverty will drive children to work more than study: With the projected decrease in agricultural income for rural Laotian, and the already low perception of education for children, households would choose for children to not pursue education. Instead of investing for a longer term return from education, the immediate effect of climate change on food security and household livelihood would increase the opportunity cost forsaken for education. This will thus drive children to make the tradeoff for work than school.

Even with the diversification of household income through migration, households may rely more on children for the unpaid chores required, hence pulling children away from education. Potentially, the climate-related migration pattern may lead to a climate-reinforced poverty trap (Jacobson et al, 2018), exacerbating the poverty situation of Laotian households and decreasing the probability of higher education attainment for children .

Children will suffer from deteriorating health: The reduced calorie intake coupled with the health related issues that may arise in Laos would weaken children and affect the quality of education they receive. In a 2017 study conducted by Save the Children in Laos, teachers and parents surveyed estimate that 8-9% of schooling days are lost due to illnesses, hazards and diseases. The common illnesses mentioned were weather-related such as flu and cold, and food-related, such as vomiting, stomach illnesses and diarrhoea. With the effect of climate change on food security, increased chance of diseases and the hotter weather, the absenteeism rate would rise higher while the quality of education may be severely impacted.

Increased hazards will make it harder for students to attend school: Save the Children's survey in Laos found that rural children faced physical hazards to attend school. These include natural challenges like raining and flooding, along with increased landslides and hazardous school environment.

This effect of climate hazard was also echoed in a report by Asian Disaster Preparedness Center (ADPC) on the impact of climate change on education. The report describes the damages done by floods prior to 2008 in various regions of Laos, including Vientiane province. It found multiple weaknesses in schools infrastructure which contributes to the estimated 2-3 weeks of missed classes due to school closure and a lack of alternative schooling sites. In light of future increased floods and hazards, the ADPC report concluded with a call for action on improved school designs to hazard-proof schools.

Given the hazardous environment, climate change would thus push children to stay at home instead of attending schools.

Government, Local Authorities and International NGO

To understand how the identified challenges of climate change can be put into actions, the report will explore the current actions done by governments, local authorities and international organisations in each of the three countries.

Cambodia: Policy Overview

The Royal Government of Cambodia (RGC) is aware of the challenge and is willing to adapt to and mitigate the effect of climate change. The country ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 and acceded the Kyoto Protocol in 2002. The National Adaptation Program of Action (NAPA) was endorsed by the Councils of Ministers of Cambodia and acted as an initial entry point for policy integration. The National Strategic Development Plan (NSDP) Update 2009-2013 specified certain priorities related to climate change response. The Draft Adaptation Programme of Action to Climate Change was released in 2012 and the National Policy on Green Growth and National Green Growth Strategic Plan was released later.

The Cambodia Climate Change Strategic Plan (CCCSP) was adopted in 2013 and provides a 10-year comprehensive climate change policy with an emphasis on climate change adaptation, mitigation and low-carbon development. The CCDSP is a new step to mainstream climate change adaptation into the country's NSDP and related policies.

The Climate Change Strategic Plan for Education was released in 2013 by the Ministry of Education, Youth and Sports (MoEYS). The Plan has two main aspects. The first is to improve school infrastructures to increase climate-resilience, to reduce energy use in classrooms and school transportations, and to encourage use of green energies. The second goal is to raise awareness of climate change through all levels of formal education and non-formal education, by incorporating climate topics into the curriculum and initiating climate-related programs.

The Climate Change Financing Framework (CCFF) was approved in 2014, which provides a useful common approach to climate finance. The CCFF specified the need to incorporate more fundings from international organizations to support the country's climate change adaptation.

In the 2017 fiscal year, 30.2% of public expenditure was either fully or partially delivering climate change benefits. In the period 2009-2017, domestic sources (national budget) represented 29% of total public climate expenditure, while external sources represented 71%. Domestic allocation has increased steadily since 2009, while external finance has followed a less constant evolution.

The Cambodia Climate Change Strategic Plan 2014-2023

Mission and Goals: The CCCSP was developed following the guidelines of the Council of Ministers. The CCCSP outlines the vision, mission, goals, and objectives, as well as the strategic framework analysis in defining the strategic objectives and strategies. The mission of the CCCSP is stated as: "creating a national framework for engaging the public, the private sector, civil society organizations and development partners in a participatory process for

responding to climate change to support sustainable development." The overall goals of the CCCSP is to reduce vulnerability to climate change impacts of people, promote low-carbon development and technologies, and promote public awareness and participation in climate change response actions.

Strategic Objectives:The CCCSP provides eight strategic objectives:

Objective 1: Promote climate resilience through improving food, water, and energy security. To explore opportunities for new crop varieties and increase agricultural diversification; to promote renewable energy, decentralized energy production and increase in energy efficiency; to build water infrastructures to improve irrigation.

Objective 2: Reduce sectoral, regional, gender vulnerability and health risks to climate change impacts. To prioritize adaptation measures for key regions such as coastal zones and highlands; to prioritize women's needs in climate change mitigation; to improve healthcare infrastructure and capacity of health personnel.

Objective 3: Ensure climate resilience of critical ecosystems (Tonle Sap Lake, Mekong River, coastal ecosystems, highlands, etc.), biodiversity, protected areas and cultural heritage sites. To strengthen biodiversity conservation; to promote eco-tourism; and to promote participatory land-use planning.

Objective 4: Promote low-carbon planning and technologies to support sustainable development. To analyze low-emission options in agriculture, transportation, industry, and forest management; to prepare relevant legal frameworks; to promote technology transfer for low-carbon development.

Objective 5: Improve capacities, knowledge and awareness for climate change responses. To promote awareness through journalists, religious leaders and community elders; to strengthen climate change education in all levels; to develop early-warning systems for climate-related disaster management and recovery through radio, television, newspapers, and websites.

Objective 6: Promote adaptive social protection and participatory approaches in reducing loss and damage due to climate change. To encourage insurance schemes and to institute public engagement as primary entry points for adaptation.

Objective 7: Strengthen institutions and coordination frameworks for national climate change responses. To mainstream climate change into national and sub-national development plans; to develop national monitoring and evaluation framework.

Objective 8: Strengthen collaboration and active participation in regional and global climate change processes. To engage with regional and global initiatives for cross learning; to strengthen cooperation with non-governmental organizations; and to secure climate funds from international funding mechanisms.

Institutional Arrangements: The National Climate Change Committee (NCCC) was established in 2006 with the mandate to coordinate and monitor the implementation of the Government's policies, strategies, regulations, plans and programs in response to climate change issues. The Prime Minister of Cambodia serves as the Honorary Chair while the Minister of Environment (MoE) is the Chair. A Climate Change Technical Team (CCTT) was established as an inter-ministerial body to provide technical support to the NCCC in fulfilling

its mandate. The Climate Change Department (CCD) within MoE serves as the Secretariat for the NCCC and coordinates the activities of the CCTT. There are climate change focal points and working groups appointed by key line ministries to oversee climate change related activities, such as the development of Sectoral Climate Change Strategic Plans, action plans and projects.

The MoE is also the designated body to reinforce negotiation in the international climate change process, to participate in regional and global initiatives on climate change, and to secure climate funds from international funding mechanisms. The Ministry of Education, Youth and Sports (MoEYS) is responsible for all the climate initiatives concerning school curriculum, teacher training, and awareness raising through media and non-formal education.

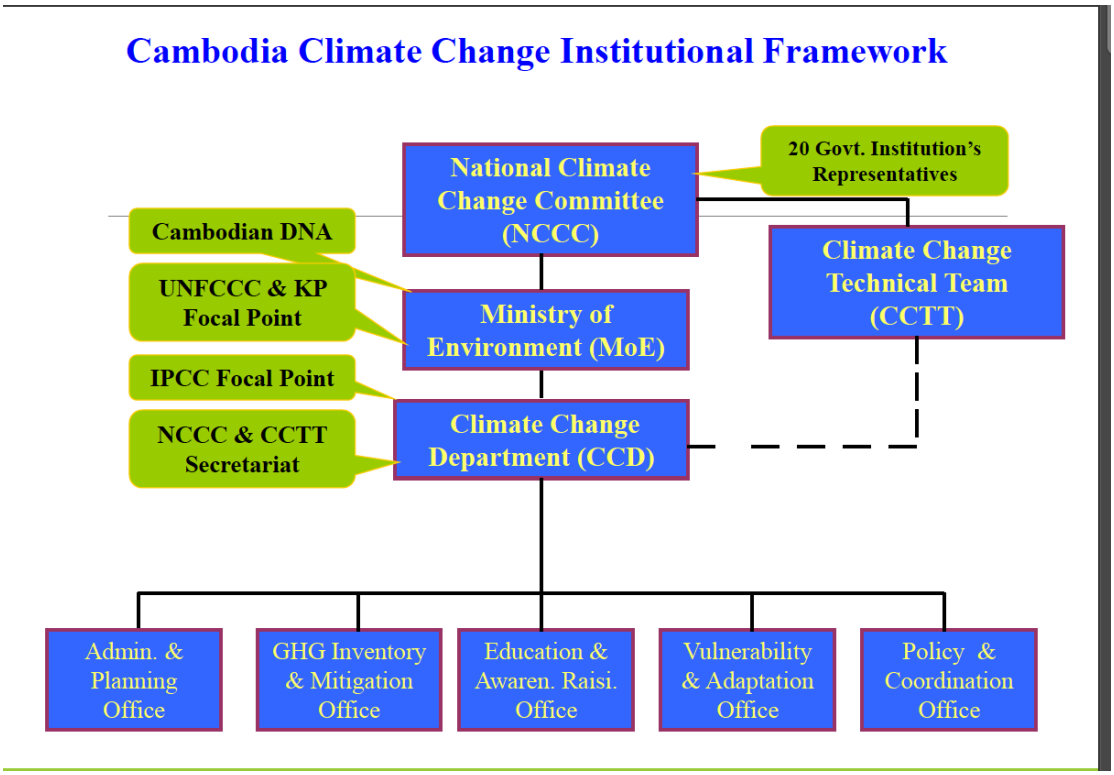


Figure 17: Cambodia's Climate Change Institutional Framework, Reference from MoEYS

Gender and Climate Change: The RGC recognizes that the rural poor of Cambodia, the majority of whom are women, are most vulnerable to climate change impacts because of their high dependence on agriculture and natural resources. This vulnerable group is also susceptible to diseases because of their limited resources and capacity to adapt to climate change impacts, including the lack of preparedness to cope with climate risks and hazards. Therefore, there is a need to mainstream gender into climate change response measures, such as into existing policies and laws, SCCSPs, in order for this cross-cutting issue to be supported by all government agencies especially at national and sub-national levels, development partners, NGOs, civil society organizations (CSOs), research and academia and the private sector.

Education Awareness and Communication: The RGC believes in mainstreaming climate change knowledge and information into formal and non-formal education. These are the key principles to sustaining climate change awareness for a green, equitable and climate-resilient society. The RGC believes it is important to create an enabling environment for climate change

education and awareness by developing and enhancing communication structures, systems and tools.

Cambodia's Climate Change Strategic Plan For Education

The Ministry of Education, Youth and Sport approved the Climate Change Strategic Plan for Education in 2013 with the goal of building capacity of teachers, students and communities on Climate Change Education and increasing understanding on Climate Change adaptation. The main objective is to foster clear awareness of the environment, to provide knowledge and skills to protect the environment, and to create new patterns of behavior of individuals towards the environment.

The Plan focuses on three main aspects: curriculum development, life skills program, and vocational education. Curriculum development refers to incorporating lessons on key environmental issues into primary and secondary educations. The curriculum includes water, land, and fossil use, disaster adaptation, population growth, deforestation, and global warming. The Life Skills Programs consist of modules that focus on fundamental environmental issues and target a particular audience or school level. Examples of these modules include use of biochemistry, land degradation, natural hazards and disaster, weather-related morality, infectious diseases and air-borne respiratory illnesses, forest health and productivity, water supply and water quality, etc. Vocational education aims to produce a workforce with high awareness of environmental protection and skills on green production. The content of vocational education includes promotion of specific disciplines, such as an educated workforce in taxonomy and systems.

Analysis of Cambodia government responses

The Royal Government of Cambodia has provided a relatively detailed strategy for national climate change mitigation, and established a evaluation mechanism which provides information on the implementation of these strategies in the current period. The Royal Government of Cambodia has given high priority to the problem of gender equality and community building in the process of climate change mitigation, and focus has been designated to school curriculums in formal and vocational education. However, we can still observe some gaps that could be potentially filled in by AEA. Firstly, despite the emphasis on gender equality, there is little information on a detailed plan of action. AEA could potentially help fill in this gap by focusing on women in rural areas, improving their situation and knowledge of proper hygiene and disease management. Another potential way of intervening is to put focus on community building and awareness raising through public campaigns, supporting local newspapers, organizing community events, summer camps, etc. in order to disseminate information on climate change.

Cambodia NGO/International Organisation

There are several NGOs and International Organisations based in Cambodia which help alleviate problems derived from climate change. Below are a few of such organisations for

future reference.

NGOs and International Organizations tackling on climate change in Cambodia

Climate investment funds: The government of Cambodia is currently developing investment plans with functions such as PPCR, SREP, and FIP to aid the most prioritized, vulnerable areas within Cambodia against climate change. Projects under PPCR total 91 million US dollars which are used to build institutional capacity to create climate resilient development plans and climate resilient water supply systems, agriculture, and rural and urban infrastructure. SREP with its 30 million US dollars is creating a multi-scalar solar energy development program, biomass power project, policy support, and public awareness efforts. The final FIP plan involves improvement on roadmaps to further accelerate natural resource management and sustainable production forests.

https://www.climateinvestmentfunds.org/country/cambodia

The Global Environment Facility (GEF) Trust Fund: Its initiative, CamAdapt, focuses on improving the resilience of community livelihoods and of the ecosystems in four coastal provinces – Kampot, Kep, Koh Kong and Preah Sihanoukon which they depend on. It has three components, which address climate change adaptation through appropriate planning, investment and capacity building measures. Collectively, they will directly benefit 101,000 people, improve the climate-resilient management of 82,000 ha of land, mainstream adaptation in 36 policies and plans, and train 3,746 people to accommodate for their living expenses.

Cambodia Climate Change Alliance: It is an EU funded alliance in line with UNDP. strengthen national systems and capacities to support the implementation and coordination of Cambodia's climate change response. In 15 pilot schools supported by the Cambodia Climate Change Alliance (CCCA), students benefited from additional teaching on climate change, and worked jointly with teachers on resilience projects such as tree planting and climate-smart agriculture.

Climate-Friendly Agribusiness Value Chains Sector Project: This initiative targets four agricultural value chains in Kampong Cham, Tbong Khmum, Kampot and Takeo provinces. It will enhance the resilience and productivity of crops, and increase agricultural competitiveness and household incomes in the targeted provinces. It will address each stage of the agricultural value chain.

U.N. Development Programme: The UNDP, in conjunction with human and social rights NGO People in Need (PIN), are pushing an early warning system run by the provincial and national government to communicate via mobile phones when residents will be facing floods. This year the program sent recorded warnings to more than 50,000 subscribers in eight provinces, said Federico Barreras, PIN's program manager on disaster management.

NGOs and International Organizations tackling on education in Cambodia

Kampuchea Action to Promote Education (KAPE): Currently the biggest local NGO in the education sector of Cambodia. It holds a close connection with the Ministry of Education, Youth and Sport (MoeYS), international organizations and local educational partners. It has research and projects at all stages of education in Cambodia. So far, it has aided 42 preschools, 172 primary schools, 110 high schools, 7 higher education institutions and 120,831 students.

http://www.kapekh.org/en/who-we-are/11#:~:text=Kampuchea%20Action%20to%20Promote%20Education,secondary%20schools%20and%20tertiary%20programs.

Bridge Of Life School: A NPO organization aiding free educational opportunities and community based aids at rural sites in the Cambodian countryside. It is an organization led by local Khmer for Khmer people. Its pillars are community, autonomy, flexibility, and sustainability. Since its focus is on rural areas, they may have interesting insights on how to approach educational concerns in rural areas.

https://www.bridgeoflifeschool.org/

Others: NGO Education Partnership websites offer connections and information on a list of NGOs based in Cambodia and in the educational sector.

http://www.nepcambodia.org/

Vietnam: Policy Overview

The government of Vietnam has demonstrated a range of national policies and concrete greenhouse gas mitigation and climate change adaptation measures. The country signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and ratified it in 1994, signed the KP in 1998 and ratified it in 2002. It supports achieving a legal agreement with the participation of all Parties to the UNFCCC, with the goal of keeping the global average atmospheric temperature increase at below 2 Degree Celsius. Vietnam has submitted to the UNFCCC Secretariat its Initial National Communication (2003), the Second National Communication (2010), and the Initial Biennial Update Report (2014), reflecting the latest climate change response efforts and GHG inventories.

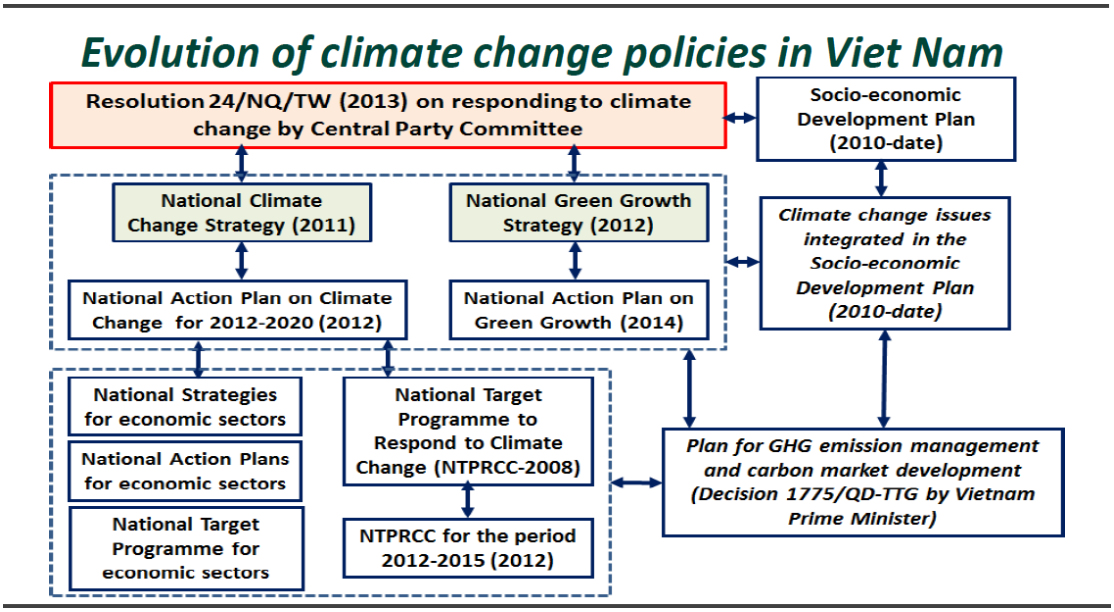


Figure 18: Evolution of Climate Change policies in Vietnam, Reference from the Government of Vietnam (2015)

In 2008, the Government issued the National Target Programme to Respond to Climate Change (NTP-RCC) in order to assess climate change impacts and develop adaptation and mitigation measures. Climate change was mainstreamed into the National Socio-Economic Development Strategy (2011-2020) and Socio-Economic Development Plan (2011-2015). In 2011, the National Climate Change Strategy was issued, outlining the objectives for 2011-2015 and 2016-2050. In 2012, the National Green Growth Strategy was approved, which includes mitigation targets and measures; and regulations on linking with international carbon markets. In 2013, the Law on Natural Disaster Prevention and Control was enacted, aiming to address diverse natural hazards that affect the country, which are primarily climate change related. The 2014 Law on Environment includes a full chapter on climate change.

Despite a tightening fiscal environment, the Government of Vietnam shows continued dedication to spending on its Climate Change response. The budget devoted to Climate Change-response accounts for a substantial share of the total budget of the Ministries. On average 18 percent of the ministries' budget are dedicated to funding climate change related activities. In 2013 the total allocation was around VND 3800 billion, which accounts for 0.1 percent of the country's GDP.

International and domestic donors, or Development Partner, plays an important role in financing Climate Change-response. Official development assistance has risen strongly.

Development Partner assistance has contributed about 31 percent of total Climate Change-response expenditure. A significant amount of Development Partner resources are directed towards State Owned Enterprises for climate change related tasks, particularly for energy efficiency and renewable energy (about VND 10,000 billion for 2010-2013).

The National Target Programme to Respond to Climate Change (NTP-RCC) provided strong technical inputs to the country's Climate Change-response by supporting mostly recurrent spending (about 40 percent) that targets activities on scientific research, technology improvement, and policy. About 51 percent of the NTP-RCC expenditure is directed towards developing Societal Capacity, and about 31 percent directed at Policy and Governance.

Vietnam's National Green Growth Strategy

The Prime Minister approved "the National Green Growth Strategy for the period 2011-2020 with a vision to 2050" proposed by the Ministry of Planning and Investment on 25 September 2012. The objective of the Strategy is stated as: Green growth, as a means to achieve a low carbon economy and to enrich natural capital, will become the principal direction in sustainable economic development; reduction of greenhouse gas emissions and increased capability to absorb greenhouse gas are gradually becoming compulsory and important indicators in socio-economic development.

The Strategy contains three main tasks. The first is to reduce the intensity of greenhouse gas emissions and promote the use of clean and renewable energy. It targets to reduce greenhouse gas emissions by 8-10 % by 2020, as compared to 2010, and reduce energy consumption per unit of GDP by 1-1.5% per year. The vision towards 2030 is to reduce greenhouse gas emissions in energy activities by 20-30%, and the long-term goal towards 2050 is to reduce greenhouse gas emission by 1.5-2% per year.

The second task is greening production, that is, implementation of a clean industrialization. It aims to encourage the development of green industry and green agriculture based on environmentally friendly structures, technologies and equipment, enhance investment in natural capital, and proactive prevention and treatment of pollution. It targets to have the value of high-tech and green technology making up a share of 42-45% of GDP; the rate of commercial manufacturing facilities that meet environment standards reading 80%; application of clean technologies reaching 50% by the year 2020.

The third task is greening lifestyle and promoting sustainable consumption. Key targets towards 2020 include: the rate of grade III cities with wastewater collection and treatment systems that meet regulatory standards reaches 60%; share of public transportation in large and medium cities reaches 35-45%; the rate of large and medium cities gaining green urban standards reaches 50%.

The Strategy provides detailed solutions to environmental issues which are summarized into the following four categories: emission reduction, agriculture and natural resources management, sustainable urbanization, and awareness raising and international cooperation.

On agriculture and natural resources management

- Develop sustainable organic agriculture, improved competitiveness of agricultural production. Apply production technologies that efficiently use seedlings, feed, agricultural materials, soil, water, etc. and reuse by-products and waste from agricultural production

to produce animal feed, mushroom, materials for industries, biogas and organic fertilizer. Speed up afforestation and reforestation and increase forest coverage to 45% by 2020, explore sustainable forest management combined with diversified rural livelihood.

- Economic and efficient utilization of natural resources. Effectively implement the Law on water resources, Law on land, Law on mineral resources, Law on environmental protection and related regulations to strengthen the use of administrative instruments based on the “the polluter pays” principle.
- Enhance investment in irrigation systems to ensure adequate supply for agricultural production.
- Promote fast development of green economic sectors to create jobs, increase income and enrich natural capital. Issue special assistance to encourage enterprises to develop green traditional products where Vietnam has competitive advantages, including herbal medicines, eco-agriculture, forestry and fisheries, foods, as well as commodities good and garments made from local materials.

On sustainable urbanization

- Review urban master plans through a sustainable urban development approach (green, ecological and economic urban areas...) with a focus on sustainable use and management of natural resources for all the people living in those cities; revise overall master plans to 2020 when cities should achieve at least an average level according to the Green City Index, avoiding overpopulating cities beyond environment and socio-economic infrastructure carrying capacity.
- Develop rainwater drainage systems, urban waste and wastewater collection, transportation and treatment systems. Apply waste sorting and recycling technologies in urban and industrial areas. Establish a Law on waste recycling.
- Promote the use of environmentally friendly green materials in construction. Prioritize allocation of land for green space. Encourage the use of public transportation that adheres to emission standards.
- Development of key sustainable infrastructure. Upgrade networks such as water transport, expressways, railways, to meet requirements for sustainable production. Refine water supply system with the goal of supplying 90% of city dwellers wit clean water by 2030. Develop power supply sources to ensure adequate supply for domestic demand, reduce elasticity of electricity/GDP from 2.0 to 1.0 in the year 2020. Improve technology of energy transportation to reduce energy losses.

On information dissemination, education and international cooperation

- Develop strong information technology as the basic infrastructure for e-Government, to connect with other basic infrastructure in socio-economic development which will provide management and governance solutions to the public and private organizations, and deliver service products, dissemination, exchange information, and e-commerce such as purchasing via email and internet. Build an information and data system on green growth at national, sectoral and local levels.
- Human resource training and development. Provide training for government staff and enterprise staff on green economy. Encourage research to identify and select contents of green technologies and mainstream these into education and vocational training at all

levels. Stimulate development on theoretical and practical topics related to renewable energy and greening production.

- Communication, awareness raising on the meaning of and ways of achieving green growth, such as the approach reduce-reuse-recycle (3R); technical assistance to the people and communities to enlarge economic and nature friendly production and consumption models.
- Promote international cooperation in scientific research, information exchange on the formulation and implementation of the basic contents of a green economy. Create favourable conditions for private and state-owned enterprises involved in international cooperation for technology transfer and human resource development.

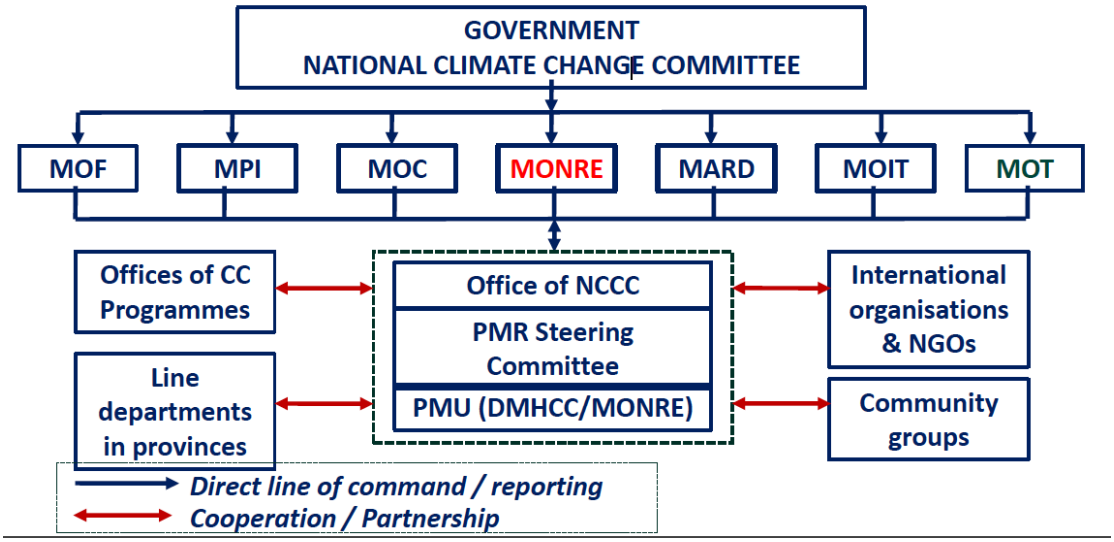


Figure 19: Vietnam's National Climate Change Committee Structure, Reference from Vietnam Government (2018)

Institutions that are assigned the task of the implementation of the Strategy includes the Ministry of Planning and Investment, the Ministry of Finance, the Ministry of Natural Resources and Environment, and other ministries. The Ministry of Planning and Investment is responsible for coordination with concerned ministries, sectors, and People's Committees of different levels, and conducting mid-point and final evaluation of the Strategy. The Ministry of Finance is responsible for approval of budget proposals and collaborates with the Ministry of Planning and Investment in developing policies to encourage green economy. The Ministry of Natural Resources and Environment is the standing body of the National Committee on Climate Change (NCCC), taking the lead in policy making process for climate change response.

Analysis of Vietnam Government Responses

With respect to education building, the government puts emphasis on recycling and reuse of resources. This is aligned with the government's goal on emission reduction. Thus, when cooperating with the Vietnam government, AeA could potentially initiate programs that help waste management and reuse of resources. When agriculture is concerned, such programs could involve constructing efficient irrigation and water supply systems. Another potential way to cooperate with the government is to provide knowledge on organic fertilizers and other techniques that can improve the productivity of land in an eco-friendly way.

Our research did not find a specific government strategy targeting education, despite some reports on primary school extracurricular readings on environment protection. One of the ways to fill in this gap is to organize summer camps for children with a topic of climate change mitigation. Another potential way is to write articles to produce radios for local mass media.

Vietnam NGO/International Organisation

There are several NGOs and International Organisations based in Vietnam which help alleviate problems derived from climate change. Below are a few of such organisations for future reference.

NGOs and International Organizations tackling on climate change in Vietnam

Asian Development Preparedness Center: The program will enhance urban resilience of coastal provinces, including Nam Dinh city (northern Nam Dinh province) and My Tho city (the Mekong Delta province of Tien Giang) to become resilient to numerous hazards resulting from climate change which includes but are not limited to, floods, droughts, and landslides.

UNICEF: Child-Centred Disaster Risk Reduction (CCDRR) approach that identifies, assesses and reduces the potential loss of lives, health status, livelihoods, assets and services. UNICEF is working to keep communities safe through initiatives such as promotion of the Safe Schools model, community-based child protection systems, raising awareness of natural disasters among children using innovative technologies and youth-led initiatives as well as mapping risks in schools and communities.

PLAN International: help children and their communities adapt and transform when faced with the impacts of climate change.

- Building awareness: Children need to become aware of the risks they face. We work with teachers, school administrators and local departments of education to teach lessons about climate change in the classroom. Children learn about why climate change is occurring, the risks they face in their communities, and the actions they can take to become resilient.
- Communities become climate-smart: Communities learn about the impacts of climate change, how to monitor and adapt to its impacts. Children and youth are involved—and take the lead—in devising community action plans as well as innovating solutions for adaptation.
- Advocacy: Children become empowered to teach others about climate change, and become active spokespeople urging for climate change mitigation and adaptation actions. Children also are empowered to take the stage and have a voice in climate action.

NGOs and International Organizations tackling on education in Vietnam

W4: This project aims to enhance education in rural mountainous Vietnam. It is especially aimed at girls and young women

https://www.w4.org/en/project/protect-rural-girls-and-young-women-vietnam-through-education/

ADDA Climate Change and Ethnic Minorities Project: this project aims to improve the ability of ethnic minorities to influence local politics in relation to consequences of climate change in northern Vietnam

http://adda.dk/wp-content/uploads/2017/05/Arafa-Khatib.Completion-of-the-Climate-Change-and-Ethnic-Minorities-Project_tb.pdf

Save the Children in Vietnam: it provides sponsorship in building up human capital in the Vietnam Sponsorship Programme that now covers an Impact Area of 23 (out of 95) communes in five districts of Lao Cai.

https://mdri.org.vn/project/midterm-performance-evaluationvietnam-sponsorship-of-save-the-children-in-lao-cai/

Norwegian Red Cross: The Vietnam Red Cross Society and the Norwegian Red Cross co-organized the "Disaster Risk Reduction Experience Sharing Workshop" from September 24-26 in Phu Yen Province

https://reliefweb.int/report/viet-nam/norwegian-support-contributes-climate-change-adaptation

ChildFund Vietnam: it provided Hoa Binh province with projects to improve writing skills through experiential learning cycles and improve comprehensive reading for ethnic minority children in primary schools. Since 2017, ChildFund has been working with the Ministry of Education and Training to replicate the project in some selected schools in four provinces namely Lao Cai, Bac Giang, Ninh Binh, and Nam Dinh.

https://childfund.org.vn/

World Vision International in Viet Nam: it has supported 184 Village Children's Reading Clubs and 39 ethnic minority mother assistants working in preschool classrooms, contributing significantly to the improvement in the reading comprehension of about 5,682 children in 30 districts across 14 provinces in Viet Nam. The ethnic minority mother assistant practice (called "Local Language Collaborators" by the Vietnam government) has been mainstreamed into the national education system of 42 provinces where ethnic minority children live.

https://www.wvi.org/vietnam/contact-us

Laos PDR: Policy Overview

The Government of the Lao PDR puts high priority on adaptation and mitigation of climate change effects. The Government ratified UNFCCC in 1995 and the Kyoto Protocol in 2003. The Lao PDR completed the Initial National Communication in 2000. The National Adaptation Plan of Action (NAPA) was released in 2009 which contains 45 priority projects with a total funding of 85 million USD, which is equal to around 1.45% of its GDP in the year 2009. The NAPA identified agriculture, forestry, water and water resources, and health as the four sectors of priorities. Water Resources and Environment Administration has been assigned as the UNFCCC national focal point for climate change and the Designated National Authority (DNA). In 2010 the government released the Strategy on Climate Change of the Lao PDR which further emphasized the importance of mitigating climate change to ensure the welfare of the people.

The country's 7th National Social Economic Development Plan (NSEDP), which covers the period 2011 to 2015, has achieved several main goals in environmental protection: 67% of the population benefited from the supply of clean water; forest cover reaches 65% of total land area; and a complete resource allocation plan has been given out to refine the use of water, land, and minerals. The 8th NSEDP (referred to as 'the Plan') identifies environmental issues as one of the main fields of improvement. Specifically, the Plan aims to increase forest cover to 70% and reforestation area to 1.5 million by 2020. The Plan also targets natural resource management and establishment of natural parks, national laboratories, and mechanisms for green and clean rural development.

In accordance with the Prime Minister Decree on the 8th NSEDP, all Ministers and Provinces were required to prepare detailed implementations to achieve the goals. Below are selected sector strategies that have varying provisions with direct implications to environmental protection.

- Natural Resources and Environment Strategy 2016-2025
- Strategic Framework for National Sustainable Development Strategy (2008)
- Agriculture Strategy 2011-2020
- Forestry Strategy to 2020
- National Water Resources Policy to 2020
- National Action Plan for Adaptation to Climate Change (NAPA)
- National Biodiversity Strategy and Action Plan 2016-2025
- National Strategy on Environment Education and Awareness to the years 2020 and Action Plan for the years 2006-2010

Due to its comprehensiveness, a detailed examination will be provided to cover the main themes in the Natural Resources and Environment Strategy 2016-2025, in the second part of this report. The third part will be dedicated to community building and National Strategy on Environment Education and Awareness, in accordance with the scope of this project.

The Laos PDR's Natural Resources and Environment Strategy 2016-2025

The Ministry of Natural Resources and Environment (MONRE) developed the Vision towards

2030 and the National Natural Resources and Environmental Strategy to 2025 (NRES 2025) based on the need for sustainable socio-economic development. It ensures maximum socio-economic benefits from natural resources utilization, and adaptation and abatement of impacts from climate change.

In order to contribute to achieve government vision towards 2030, the MONRE's vision towards 2030 focuses on: "Making Lao PDR Green, Clean and Beautiful, based on Green Economic Growth, to ensure Sustainable Resilient Development and Climate Change."

The NRES 2025 identifies the following goals:

1) Make Lao PDR Green to ensure peoples livelihood, biodiversity and contribute to mitigate the global warming from greenhouse gas emission
    a. Increase forest cover by 70%
    b. Reserve 50% of protected and protection area for biodiversity
    c. Streets, public building and office areas greened with trees
    d. Cities larger than 100,000 have a park with trees for recreation
2) Make Lao PDR Clean and Beautiful to ensure good quality for Lao people:
    a. Reduce water and air pollution by 30%
    b. Reduce use of hazardous chemicals by 20%
    c. Reduce waste generation by 30%
    d. Waste separation practice in 50% of households in six priority provinces
3) Contribute to the green growth economy to achieve sustainable development and contribute to the climate change mitigation
    a. Increase green production satisfying ISO 14001 standards
    b. Reduce greenhouse gas emission by 20%
4) Prepare Lao PDR for Climate Change Adaptation and Reduction of natural Disaster impact
    a. Provide people with easy and timely updates to climate change and disaster data
    b. Provide people in vulnerable areas with knowledge to prepare and respond to disasters
    c. Reduce the impact of disasters to livelihood, agricultural products and investment

The main issue in the strategy are the protection and use of natural resources for maximum social benefits, the development of cities and rural areas, local participatory on natural resources development and management, the adaption to and mitigation of climate change, strengthening of regional and international alliances and partnerships and building the required capacity in MONRE to ensure effective and efficient natural resource management, climate change adaptation and mitigation, and environmental protection.

Laos PDR National Strategy on Environment Education and Awareness to 2020

The Decree on the Agreement and Endorsement of the National Strategy on Environment Education and Awareness to the years 2020 and Action Plan for the years 2006-2010 was signed by the Prime Minister of the Lao PDR. The goal of this Strategy is stated as: "The people will have environmental knowledge and skills, positive attitudes and values for the Environment, and by participating in sustainable environmental management and

conservation of natural resources will improve the quality of life for all and ensure sustainable development."

The Strategy offers detailed implementations in various sectors of education. For primary school students, a series of six books titled "World Around Us" are available to all students. For secondary school students, there is integration of environmental concepts in natural science curriculum. Teachers for primary and secondary level education are also given intense training on environmental issues. Higher level educations, such as the National University of Laos, emphasis is given to research on climate change impacts, resource management, as well as technical innovations on farming, industry, forest management, and so on. Vocational centers provide training on environmental-friendly vocations such as chicken farming, mushroom farming, and dyeing with natural dyes.

Apart from formal education sectors targeting mainly teachers and students, the Strategy also incorporates informal education targeting the general public. It provides health education which encourages citizens to use latrines and teaches households to dispose of solid waste and wastewater according to sanitation principles. Environmentally sustainable income generation approaches are also provided to the public, such as organic farming which reduces the use of fertilizer and pesticide, forest and water protection, and the use of natural alternatives to synthetic products.

Active public campaigns through mass media is another way of raising public awareness on the protection of the environment. The Law on Environmental Protection has been disseminated to the public. Two radio AM program "life and science" and "conservation of the environment" and two radio FM program "environmentally friendly agriculture" and "the surrounding environment", as well as newspaper and national TV, constantly provide the public with information on prevention and management of natural disaster, waste management, prevention of illegal wildlife trade, sustainable farming, and so on.

The strategy has various legal and institutional bases. For example, Article 1 of Chapter I of the Law on Education states that one objective of education is to make people participate in the protection of natural resources and the environment in order to contribute to the protection and development of the nation. The environmental protection Law NO. 102/PM states that "the Ministry of Education has duties to develop a curriculum on the environment" and that "the Ministry of Culture and Information is assigned to coordinate with concerned ministries, local administrative authorities, and other government agencies to disseminate information on environmental protection in varied manners such as magazine, newspaper, radio and television."

Apart from the National Strategy on Environment Education and Awareness, many other government documents also reflect the importance of education and community building in terms of raising public awareness of climate change and environmental protection. The National Adaptation Programme of Action to Climate Change emphasizes the importance of knowledge and information dissemination. It specifies the essential role that information plays in disaster warning systems, improving farming techniques, proper water management, and prevention and response to epidemics and water-borne diseases. The Strategy on Climate Change of the Lao PDR states that high-ranking decision makers in government and private sectors should be provided with factsheets and constantly be informed of the updates on environmental related problems. Technical staff, as well as governmental officials, should be provided with educational tours in national reserved areas and if possible, international educational tours, to be better informed of the importance and best practices of sustainable

development and environmental protection.

Analysis of Laos PDR Government Responses

The government of Laos has dedicated a detailed plan for climate change education in both formal and informal education sectors, which offers AEA a clearer way of cooperation. Certain international organizations have already explored some initiatives, such as summer camps for students or publishing articles in newspapers, which turned out to be effective. AEA could also consider helping provide factsheets for stakeholders and government officials on the latest developments of climate change in the region, in order to ensure more efficient and effective policy making. Apart from the ways mentioned above, there is also potentials to develop remote learning programs which could help students that do not have access to school due to extreme weather conditions.

Laos PDR NGO/International Organisation

There are several NGOs and International Organisations based in Laos PDR, which help alleviate problems derived from climate change. Below are a few of such organisations for future reference.

NGOs and International Organizations tackling on climate change in Laos PDR

Green Climate Fund: a major funder of climate projects, has approved a US$10 million project that's expected to benefit 10 percent of Laos' population. The project represents a major 'paradigm shift' of urban flood management in Laos, from hard infrastructure towards the integration of nature-based solutions, including the restoration of 1,500 ha of urban wetland and stream ecosystems to regulate water flow and thus reduce flood risk

https://www.greenclimate.fund/about

GIZ: this organization helps the government of Laos in rural development and sustainable economic development. GIZ supports the government in developing regulations and laws relating to land policy and land rights especially in the rural areas. This formalizes land use in such areas which help the rural population to improve its legal and economic position.

https://www.giz.de/en/worldwide/371.html

Asian Development Bank: This organization operates in many parts of Asia. In Laos, their main focus is to improve physical connectivity in private sector investment, increase employment, and aggregate incomes. They aim to develop skills that will promote non resource sectors and access to health services to further develop labour productivity.

https://www.adb.org/

Australian Humanitarian Partnership: activated to coordinate a component of Australia's humanitarian response to the flash floods. AHP NGO partners CARE, Plan International and

Save the Children came together to deliver a coordinated disaster response. AHP partners also assisted with the implementation of the Lao PDR Government's Back-to-School plan, aimed at reducing disruptions to education for flood-affected students through the repair of schools, construction of temporary learning centres and distribution of student study materials.

https://www.australianhumanitarianpartnership.org/preparedness-1/category/Laos

NGOs and International Organizations tackling on education in Laos PDR

Plan International: This organization, founded in 2008, operates to advance children's rights and equality of girls. Their focus is especially on vulnerable communities: places with low school enrolment and completion, poor hygiene, little-to-no access to sanitation, limited safe water and high levels of malnutrition. One of their aims is to provide access to quality education especially for girls.

https://plan-international.org/laos

UNICEF, Basic Education Girls Project:The project focuses on constructing new schools and repairing existing schools in Luangprabang and Xiengkhuang. In Luangnamtha, Phongsaly and Oudomxai, the project funds repair for existing schools by providing construction materials with a total budget of 10,000 USD for each school and community has to contribute labor and wood.

https://www.unicef.org/evaldatabase/index_23769.html

Japan International Cooperation Agency (JICA): The objectives of the project are to construct new primary schools in Vientiane Capital and Vientiane province, transforming them from deteriorated and temporarily built structured classrooms to an improved educational environment for primary school education and to maximize the number of students attending the permanent school.

https://www.jica.go.jp/laos/english/office/index.html

Korea International Cooperation Agency (KOICA): KOICA provided 2 primary schools in Luangprabang Province and Vientiane Capital

https://www.facebook.com/koica.laos/about/

Save the Children, Australia: SCA provided assistance to improve the quality of primary education and mainly focus on remote and poor areas.

https://www.savethechildren.org.au/our-work/our-programs/international/primary-health-care

Recommendations

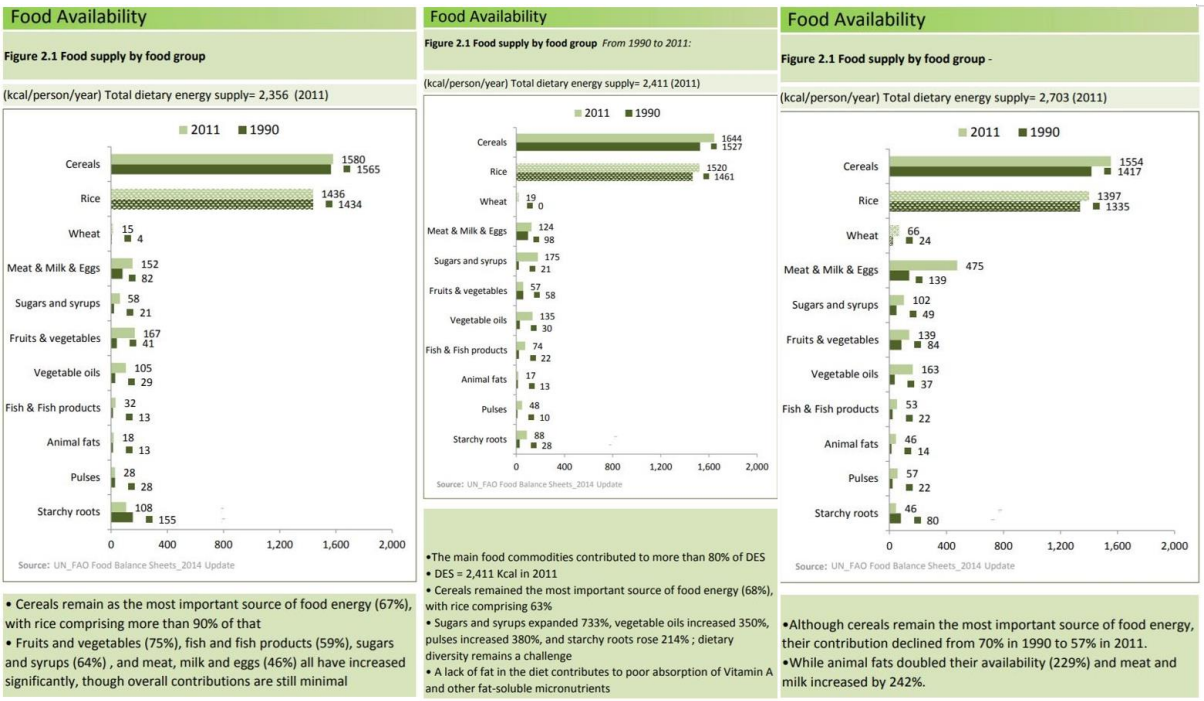
Based on the above analysis, each local authorities recognise the effect of climate change, taking varying actions to combat them. These actions are focused on the economic and policy aspect of climate change, addressing the income and migration effect it has on a community. There are also efforts by some countries on the issue of health, food insecurity and poor infrastructure in rural areas, albeit not as concerted. This is also why many NGOs and International Organisations work to fill this gap.

Having considered the feasibility and impact of a project and AEA's past projects, this report provides 4 recommendations for AEA. Two of these recommendations address the immediate effect climate change has on the community, by combating the looming food security issue and the health problems. The other two recommendations tackle the school access problems by developing an alternative education channel through radios and to effect a paradigm shift among communities on the usefulness of education.

Recommendation: Improving nutrition access and literacy

Malnutrition has no universal census on its definition and identification, with many descriptions of undernutrition alone to under- and overnutrition, with varying versions of intakes as well (Elia, 2017). Referring to WHO's definition, it is the "deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients". In our solution, we will focus on undernutrition, which covers stunting, wasting, underweight and micronutrient deficiencies and insufficiencies (WHO, n.d).

Nutrition literacy has been identified as one of the key recommendations for improvement in the 2016 ASEAN report, highlighting that educating communities on nutritional intake have long-term impacts. Additionally, with malnutrition having direct impacts on cognitive potential, solving such issues in communities has positive spillover effects.



Cambodia Lao PDR Vietnam

Figure 20: Ma

Deep diving into the 3 countries, it has been found that they have different nutritional intakes and food availability, leading to different micronutrient deficiencies. In Cambodia, malnutrition manifests itself by propagating persistently high levels of stunting and underweight, high levels of anaemia, and Vitamin A deficiencies (ASEAN Report Volume 1, 2016). This can be attributed to a lack of fat in diet, which contributes to poor absorption of Vitamin A and other fat-soluble micronutrients. Similarly, Lao PDR also faces high levels of stunting, underweight, Vitamin A deficiency and anaemia. Vietnam, in contrast, has seen sharp declines in underweight and stunting in recent years. However, anemia represents a persistent issue, particularly among pregnant women and children under 5 years of age. This can be concluded due to Vietnam's increased food availability, having much higher animal fats, meat and milk consumption in recent years compared to Lao PDR and Cambodia (ASEAN Report Volume 1, 2016).

Figure 21: Food inadequacy in ASEAN Member States, 2014-2016

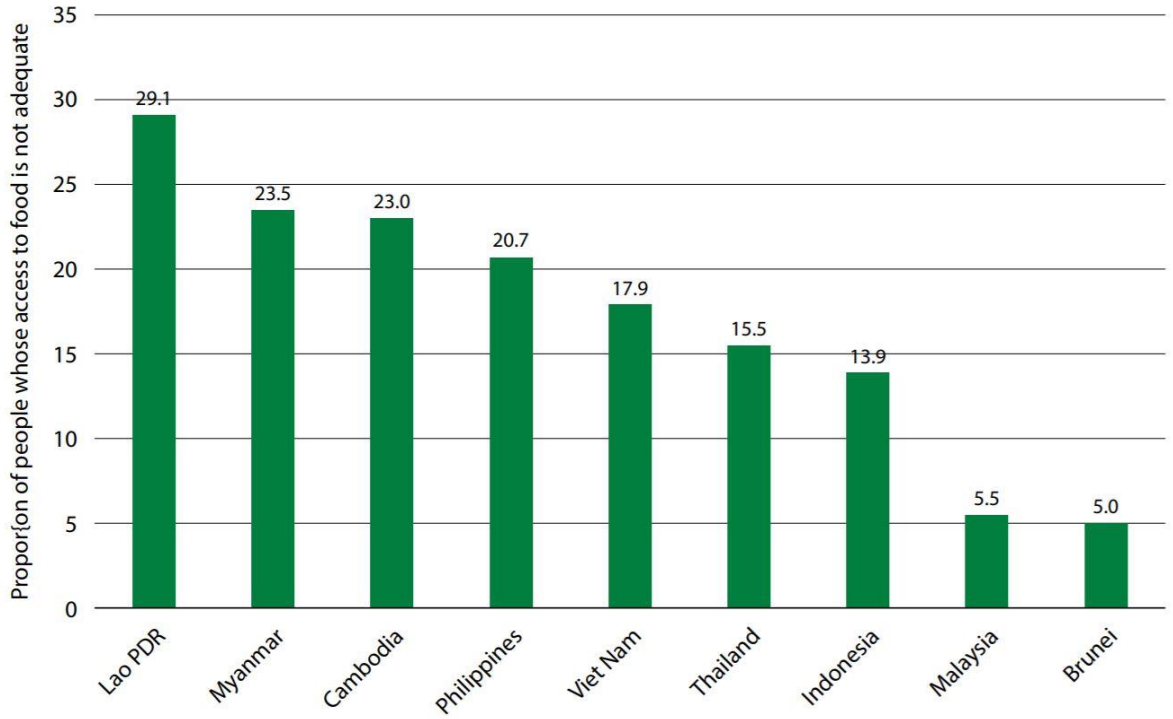


Figure 21: Food inadequacy in ASEAN Member states, Reference from: HI

Focusing specifically on food inadequacy, each country faces a different level of severity of food scarcity, with Lao PDR having the highest at 29.1%, Cambodia at 23% and Vietnam at 17.9%. However, they all share similar critical micronutrient deficiencies - Folic acid, iron, Iodine, Zinc and Vitamin A (ASEAN Report Volume 2, 2016). This presents a nutritional focal point that can be targeted at efficiently in all 3 scenarios, especially in younger children and women.

Critical Considerations: In many countries, NGOs and governments have worked together to implement School Feeding programmes in these countries such as in Laos and Cambodia. A review by WFP has noted that trends have encouraged the local procurement of foodstuffs for school lunches.

Additionally, it is crucial to prevent duplication of such programmes, requiring the systematic liaison of other UN agencies, governments and NGO bodies (World Food Programme, 2017).

Although supplementing IFA (Iron and Folic Acid) would resolve a significant proportion of anemic women and children (Kotecha, 2011), it cannot be achieved solely by simply providing access nor nutrition literacy. The RANI project, conducted in Odisha, India had the novel idea of improving IFA supplementation via a norms-based intervention (Sedlander et al, 2018).

On a different tangent, Feed the Future has piloted a project to combat Anemia in Uganda. Establishing a village shop which sells seeds for iron-rich beans and other nutritious foods, showing extremely high uptake and support from the community. Adapting it to local contexts where the predominant source of food is rice, Iron-rich rice seeds can be sold instead to encourage a more nutritious substitution. Another potential solution involves iron fortification

of potable water such as in Brazil. It has been described as a simple and efficient method, significantly reducing the childhood anemia population by 50% in 8 months post-intervention (Lamounier et al, 2010).

Implementation: In providing food nutrition, AeA can structure a more successful programme by linking with existing organisations who already have such infrastructure and changing the community perceptions by introducing self-sustaining sources, engaging community on different levels as well as educating in schools.

Possible collaborations: There are several organizations which AEA may collaborate with.

Asian Development Bank: They have projects that fortified rice with critical micronutrients such as Vitamin A and Iron in the ASEAN region.

Link: https://www.adb.org/projects/documents/rice-fortification-poor-0

Food Fortification Initiative: https://www.ffinetwork.org/asiapacific

World Food Programme

Save The Children

Recommendation: WASH with Education

Many children in Cambodia, Vietnam, and Laos leave schools due to health issues such as diarrhea which can be decreased by improved sanitary measures. This section will focus on possible actions taken by the AEA to improve sanitary measures in these countries through WASH (Water, Sanitation and Hygiene) programmes.

Overview: According to organizations such as the WorldVision that work in improving sanitary environments in developing countries, facilitating toilets, building wells, and creating local communities to deal with these water-related issues have helped many communities in the past. From this story, AEA may focus on activities that are related to physical developments such as facilitating toilets and wells as well as community building such as creating local awareness communities.

Critical considerations: To support these communities in the most effective way possible, it is important to understand the characteristics and customs of the communities and to implement the most suitable solutions to each community. After implementation of the project, the maintenance of physical facilities will most likely be done by local people so from the launching of projects, the respect of the wills of its local residents and building trust between them is important.

In the case of WorldVision, a board comprising elected villagers is created for maintaining the wells built by WorldVision. These elected villagers collected a set of fees from the villagers regularly to maintain the wells. Afterwards, the data showed the villages with such organizations benefited from more effective and higher functioning wells in a longer span of time. Another example which illustrates the importance of implementing the most suited solution for each village are that of selecting from different formats of wells. In projects initiated by WorldVision, wells were selected from a rope pump, water distribution system by natural flow, and rainwater storage tank accordingly with the customs and environment of each village. As a result, these wells were adaptable, thus more effective.

Implementation: There are two possible ways in which AEA can contribute to this plan. One is to directly create infrastructures such as wells and toilets for rural villages. This will allow the villagers access to a better sanitized environment. However, at the same time, building infrastructure will require professional skills, funds, and long periods and may be difficult without insight from organizations with past experiences.

The second way AEA can contribute to this area is to accumulate information about each village. Later, experienced organizations in this sanitation field can use this information to work efficiently in implementing the most effective sanitary measures in each village. Further on, AEA can collaborate with these organizations and take over part of their plans such as to build communities and board members to maintain built infrastructures.

Since AEA already acquires a broad range of networks with local organizations, the second work which focuses on building connections and communication with locals may be better suited for them.

Possible collaborations: There are several organizations which AEA may collaborate with.

Water Centric: it often works as a bridge between international funding and local communities. As a result, they introduce best fit technology regarding sanitation in each of the communities. http://www.watercentric.org/aboutus.html

WorldVision: this organization works alongside UNESCO and the world food program and its main focus in humanitarian aid which also includes sanitary measures.

Other potential organizations include UNICEF, Oxfam, The Vincente Ferrer Foundation, Educo, The Pies Descalzos Foundation, and Save the Children.

Recommendation: Remote Learning

With the effect of climate change, school participation will be impacted. One common vulnerability identified is the poor schooling infrastructure. To tackle this issue, however, a large amount of investment is required. AEA can instead work to set up channels to bring education to children in response to climate change.

Currently, AEA is involved in Cambodia's Ministry of Education, Youth, and Sport's (MoEYS) campaign for radio learning and helped distribute 3,365 radios to families with students in Grade 1-3. This initiative is in response to the need for school closure during the COVID-19 pandemic and sets the stage for distance learning.

The initiative is a commonly identified approach around the world. UNICEF (2020) estimates that in response to the school closures due to COVID-19, more than 90 per cent of countries have implemented some form of remote learning policy. These policies aim to minimise the disruption of education for the 463 million students around the globe by addressing the lack of remote learning policies or the lack of equipment for learning. For remote learning policies, digital instruction is a common approach (Figure 22). This is followed by broadcast curricula (television- and radio-based). The full list of policies rolled out is compiled by the World Bank as follow:

https://www.worldbank.org/en/topic/edutech/brief/how-countries-are-using-edtech-to-support-remote-learning-during-the-covid-19-pandemic

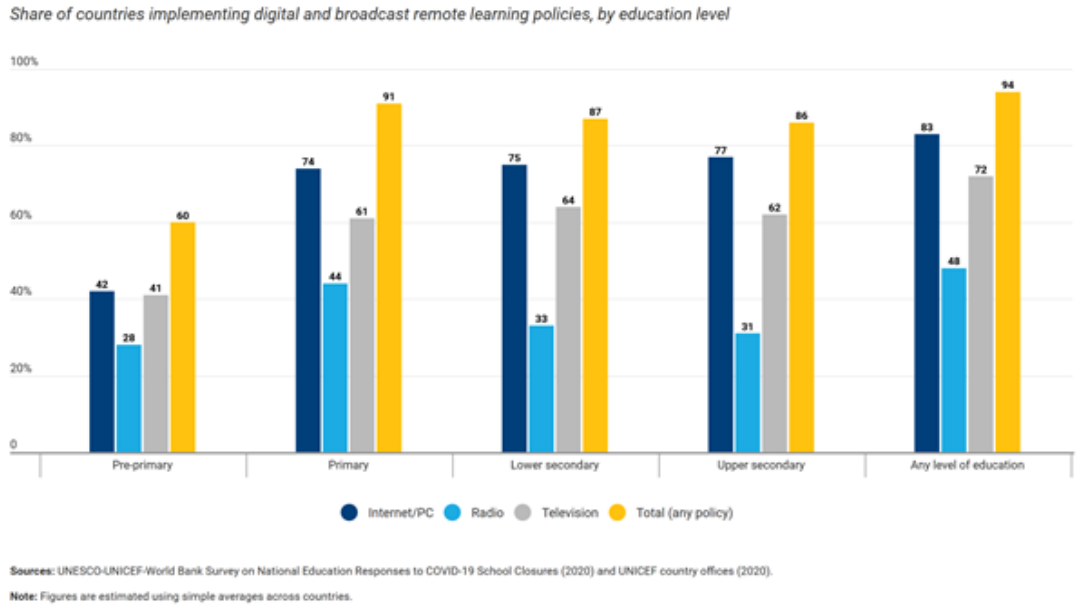


Figure 22: Share of remote learning policies by grade, Reference from World Bank

Of the initiatives taken, interactive audio instruction or IAI is promising. It allows access to people without computers or internet and has great penetration globally. The interactive audio is also scripted with the radio teacher guiding students through the lessons. Parents or caregivers can also help without feeling the helplessness of homeschooling their children. Psychologically, the scripted lessons can also be crafted in a positive and encouraging manner to provide a safe learning environment for children (EDC, 2020).

Implementation: Firstly, AEA would have to consider the program fit. These include the language, grade level, subject matter, and pedagogy in delivering the lessons. Other considerations include its fit with the national curriculum, the degree of caregiver involvement in the learner's education, the ratio of remote learning and face-to-face lessons to optimize the learning experience of children, and the ease of implementation for teachers and facilitators. These programmes can be developed with the respective Ministries of Education or with other international NGO involved in education in these areas such as Cambodia Youth Action.

Secondly, AEA can explore the medium of dissemination and publicity. Depending on the country, AEA can adopt different strategies to bring education to children. According to the annual digital report by Datareportal, Cambodia has a low internet penetration of 58% in 2019. Laos PDR also has a similarly low figure of 43%. This suggests a high likelihood that poor, rural communities do not have internet. AEA can choose to adopt IAI through radio learning to reach out to these communities. For Cambodia, this entails working with the government to expand its current remote learning plans while also being involved in the planning and recording of these lessons. For Laos, the development of its current AM and FM Channels suggest that radio penetration is relatively widespread. AEA can, instead, focus efforts to repurpose the radio medium to be used for educational broadcasts. These can be achieved with appropriate curriculum planning and a buy-in by the ministry of education for Laos and local telecommunication firms.

For Vietnam, the Datareportal report shows a higher internet penetration of 70% in the country. For these users, AEA can target their youths and children via the internet rather than radio. In the report, it also finds that a majority of the Vietnameese users seek videos (95%) and audio streaming (73%). Furthermore, other longer contents such as vlogs and podcasts also capture a substantial attention among internet users (Figure 23). This suggests that there is a receptive target AEA can target with such educational materials. The primary platform that AEA can target is either on Facebook or Youtube since these are the more frequented websites (Figure 24). AEA can choose to develop these internet platforms to reach out to children in rural areas and increase their engagement.

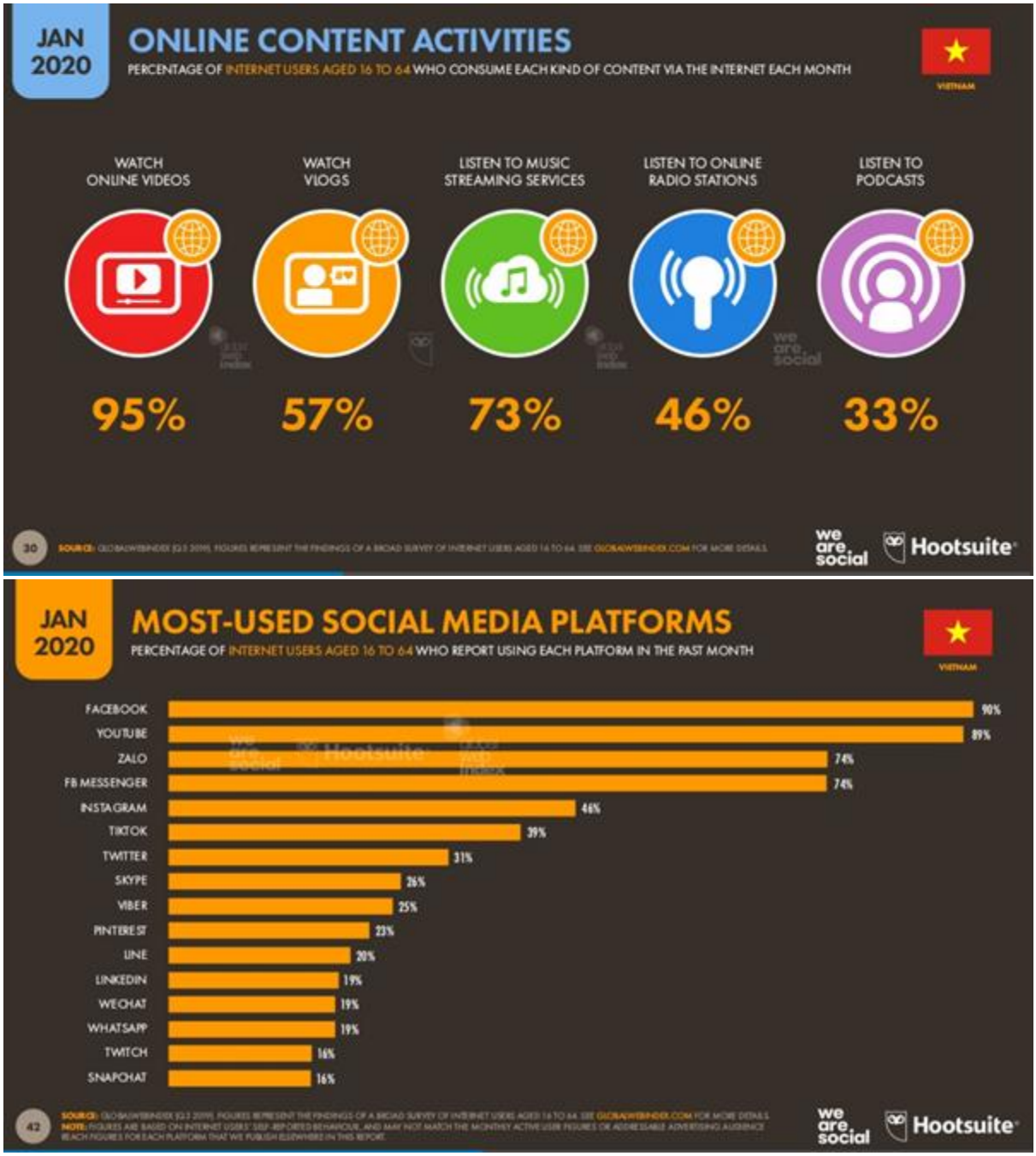


Figure 23, 24: Online content activities in Vietnam and Social Media Platform usage in Vietnam, Reference from Datareportal (2020), Retrieved from: https://datareportal.com/reports/digital-2020-vietnam

To have a targeted approach, AEA can focus on pre-primary level education. It is a grade not commonly emphasized among communities in Vietnam, Cambodia, and Laos but the remote learning opportunities in this level yield huge returns. Atsuko et al (2020) find that every dollar invested in increasing enrollment in pre-primary education returns $9 in benefits to society in the form of reduced repetition and dropouts in primary and secondary school, as well as increased lifetime earnings for individuals. Atsuko et al (2020) also identified that policies should also recognise and engage parents to be involved for the learning of their children to be effective.

A potential expansion in the longer run and with resources and funding, is to aid in enhancing

internet penetration to the communities it serves. Infrastructures such as broadband towers and satellite dishes aid in beaming the internet into each home. In terms of education, this expands the resources available for children to have an effective learning environment. Parties to partner with such expansion include the local authorities, internet providers or potential technology funders.

A case in point would be the successful radio learning done in Rwanda funded by UNICEF. where lessons are available on Radio Rwandan. Each radio lesson is approximately 20 minutes long and focuses on interactive learning. Lessons are designed for students to participate on their own, but parents and caregivers are encouraged to listen in and support them at home. The lessons start with a short review before the teacher proceeds with a short lecture. These are done interactively by giving students opportunities to engage at home. Each lesson will then conclude with a summary, and an indication of the next lesson topic.

UNICEF also caters to children with disabilities by partnering with local groups to provide sign language interpretation of video contents.

Critical Considerations: Among the initiatives rolled out in other parts of the world, AEA can learn and avoid the obstacles others faced. Some identified obstacles include the buy-in of parents and the availability of a conducive learning environment.

Childfund and Save the Children found that in Vietnam, parents are a key driver for effectively learning among children. The learning can be made active by integrating it with daily activities such as measuring rice, counting corn, selecting vegetables or learn Vietnamese through naming home-stuff. These were done because both organisations helped parents overcome the initial helplessness in educating their children. In the case of this recommendation, lessons can be designed to engage parents and children concurrently for parents to take on more active roles. It would also aid in changing their perception towards education and prioritise time for their children to study instead of working or doing domestic chores.

AEA can also aid communities to design spaces as classrooms or provide learning materials to facilitate their education. EDC has provided a suggested guideline in aiding families with such physical transition in communities.

https://www.edc.org/sites/default/files/Repurposing-Established-Radio-Audio-Series.pdf

One possible set back is the lack of radios or the lack of line-of-sight for radio waves to penetrate to these regions. These technological limitations cause the learning to be disjointed, slow and frustrating for the children and parents. Given the low perception of education identified above, this serves to push these communities away from education instead. In such cases, In anticipation of this, AEA could provide pre-recorded tapes or pre-loaded USB drives with educational material already available. In a scenario where learning is disrupted, readily available material will be on-hand for children to continue with their education.

Possible Collaborators:

Local Ministry of Education in all three countries have rolled out some degree of remote learning according to the World Bank. Cambodia is the most active in this aspect, setting up multiple platforms online and through radio, whereas information on Vietnam and Laos remote

learning initiatives are limited. Having worked previously with these local authorities, AEA could engage with these ministries to initiate and extend remote learning schemes and make education more prevalent. Given the resources and expertise these ministries have, they can be an effective catalyst in diffusing remote education to rural and poor communities.

UNICEF is a strong supporter of continuous learning especially during the COVID-19 crisis in developing countries. It has pooled together the support of other developed countries such as Japan and Sweden to set up such remote learning avenues in South East Asia such as in Vietnam and Cambodia (UNICEF, 2020). This is an effective avenue AEA can tap on to rally support and resources to this initiative.

International NGOs such as Save the Children Australia and Child fund are heavily involved in the education work in these countries. Tapping on their network with rural communities and their expertise in education can aid in reaching a larger population and develop a more effective teaching programme.

Another group of collaborators AEA could work with are local telecommunication companies, such as Laotel in Laos, or Viettel Mobile from Vietnam. These network companies have an incentive to extend their user base while AEA can reach out to more students in rural and poor communities.

Recommendation: Cultural Shift

Changing the mindset and environment that keeps children away by disseminating the effectiveness of education or easing the pressure on children to stay at home to work/care for elderly or incentivising family decision-makers to place education ahead of immediate gains.

A study with Vietnamese children and youth highlighted that children and young people are more astute to the psychological effects of poverty. They gave a much higher priority to psychological well-being than cash income. Being loved and cared for by their parents, being in good health and having access to education and recreation were the most important issues for them. Hence, the long-term approach plans to involve the community by changing the culture towards education from young.

Drawing on the Advancing the Right to Read (ARR) programme that takes place in Rwanda for children up to 9 years old, the programme piloted innovative projects to improve literacy acquisition in the community. 2 innovative projects provided by ARR that have been identified as being adaptable are First read and Literacy Boost.

1) First Read: It is an approach that aims to provide parents/carers of children ages 0-6 with skills, confidence and materials to support development of children pre-reading skills through 4 pillars:

- Book development
- Book gifting
- Family learning
- Community Action

It offers a systematic way to help parents learn and apply knowledge to support children to develop crucial emergent literacy skills, basic arithmetic etc. It can also be used to complement other early childhood programmes that focus on health, nutrition, safety etc.

2) Literacy Boost: Literacy Boost as a programme has been expanded to 24 countries since its inception in 2009, even reaching countries like Vietnam, Afghanistan and Sri Lanka.

The approach focuses on 3 components of teacher training, community action and assessment, complementing the early years of schooling.

Teacher training focuses on training teachers in simple techniques to enhance children's reading skills, even when teaching the national curriculum.

Community action consists of delivering reading awareness workshops to parents and the community, training them on ways to support their child's reading by providing book banks/libraries where they can have access to such recreational reading materials and offer extracurricular reading opportunities in the communities e.g reading clubs, reading buddies and reading festivals.

Assessment includes systematically measuring children's reading skills and identifying strengths and gaps in performance and monitoring progress over time.

Additionally, with those 3 components, the success of those initiatives depend on local partnerships. In the field of book dissemination in these specific countries, there are many NGOs that have entered this subspace which can be partnered with for book dissemination, in conjunction with educational programming.

	Cambodia	Laos	Vietnam
Book Dissemination	The Asia Foundation - Books for Asia Programme	Reading Elephant Laos - Books for Laos Programme	Centre for Knowledge Assistance and Community Development (CKACD)

Additionally, these Rwandan projects focused on enacting Community support in the first stages of their project, conducting village-level reading workshops, training volunteers to run reading clubs. Partnering with community-based institutions also provide the most viable opportunity for cost-effective expansion, providing practical support such as safe, sheltered spaces.

Critical Considerations: Other innovative models include Model teachers (MTs) and Peer-learning circles (PLC) which have shown improved educational outcomes as well. MTs are trained invigilators who are trained to provide educational support, facilitating student learning. PLCs serve as means of peer support and encouragement to help one another implement lessons by jointly planning, observing and following. Additionally, it has been found that smaller circles, 3-5 per session, would minimise the number of unattended students to promote better discussion.

This was done with local NGO support, meeting with all community institutions, including religious institutions and business owners who employed the majority of the population (E.g Tea cooperative/ Factory Representatives). Partnership of the labour side was assessed to be even more helpful as they aid in promotion and funding. The partnership was formalised with Memorandums of Understandings.

Cambodia, Laos and Vietnam are at different stages of promotion of basic education, each with their own challenges and limitations. However, the rural areas in all 3 areas do experience the same disparity compared to their city counterparts, experiencing a shortage of quality and quantity of education resources.

Implementation: The main goal of such a programme is to encourage children, adults and the community to better recognise the value of education as an investment in future skills and output. By increasing avenues for young children to pick up the good habits of learning by providing conducive infrastructure such as learning hubs in communities, it would encourage people to visit. Additionally, engaging other stakeholders in the community such as village elders to gain their support and approval is crucial to ensure a sustainable programme.

Conclusion

Climate change has a direct effect but the repercussion it has on the health and livelihood of individuals differ based on their vulnerability. These vulnerabilities differ based on the socio-economic environment of the individual and community. However, the report has identified that there are common underlying factors across the three countries' impact. Furthermore, the simple mapping of initiatives and effort aid in understanding where the current efforts are and reduce overlap in efforts. With these insights, AEA could better anticipate climate change effects and integrate climate resilience in its operations and across its network.

References

Acosta, P., (2006) Labour Supply, School Attendance, and Remittances from International Migration: the Case of El Salvador. World Bank Policy Research Working Paper No. 3903, Washington.

Adelaide Baronchelli & Roberto Ricciuti, (2018), Climate change, rice production, and migration in Vietnamese households, United Nations University-WIDER Working Paper 2018/86

Aide Et Action Southeast Asia, (2020), Cambodia's ethnic minority children are tuning into a new form of learning during Coronavirus crisis, Aide Et Action South East Asia Website, Retrieved from: https://seac.aide-et-action.org/cambodias-ethnic-minority-children-are-tuning-into-a-new-form-of-learning-during-covid-19/

Akresh, R., (2016). Climate change, conflict, and children. The Future of Children, 26, 51–72

Anh Tuan Bui, Mardi Dungey, Cuong Viet Nguyen, Thu Phuong Pham, (2014), The Impact of Natural Disasters on Household Income, Expenditure, Poverty and Inequality: Evidence from Vietnam, Applied Economics 46(15):1751-1766

Asian Disaster Preparedness Center, (2008), Study on impacts of disasters on the education sector in Lao PDR, Retrieved from: http://www.adpc.net/Igo/category/ID124/doc/2013-m6HTl8-ADPC-Lao-Impacts_Disasters_Education.pdf

Atsuko Muroga, Htet Thiha Zaw, Suguru Mizunoya, Hsiao-Chen Lin, Matt Brossard and Nicolas Reuge, (2020), COVID-19: A Reason to Double Down on Investments in Pre-primary Education, UNICEF Paper, Retrieved from: https://www.unicef-irc.org/publications/pdf/COVID-19_A_reason_to_double_down_on_investments_in_pre-primary_education.pdf

Barrett, Peter; Treves, Alberto; Shmis, Tigran; Ambasz, Diego; Ustinova, Maria, (2019), The Impact of School Infrastructure on Learning : A Synthesis of the Evidence. International Development in Focus;. Washington, DC: World Bank, Retrieved from: https://openknowledge.worldbank.org/handle/10986/30920

Batbaatar, M., Bold, T., Marshall, J., Oyuntsetseg, D., Tamir, Ch., Tumennast, G., (2005), Children on the move: Rural-urban migration and access to education in Mongolia, Childhood Poverty Research and Policy Centre (CHIP) Report No.17, Save the Children and University of Mongolia. Retrieved from: www.childhoodpoverty.org/index.php?action=publicationdetails&id=99

Brown & Park, (2002), Education and poverty in rural China. Economics of Education Review Volume 21, Issue 6, December 2002, Pages 523-541

C. Lohmann, I. Liefner, (2009), Location, non-agricultural employment and vulnerability to poverty in rural Thailand, Erdkunde, 63, pp. 141-160

Chang Hongqin, Dong Xiao-yuan, MacPhail Fiona, (2011), Labor Migration and Time Use Patterns of the Left-behind Children and Elderly in Rural China, World Development Volume 39, Issue 12, December 2011, Pages 2199-2210

Cheng Chao Zhou et al., (2015), “China’s Left-Behind Children: Impact of Parental Migration on Health, Nutrition, and Educational Outcomes,” Health Affairs 34, no. 11 (2015): 1964–71.

Chun, Jane, and Le Thang Sang, (2012), Research and Policy Dialogue on climate change, migration and resettlement in VN. Final Report. UN Viet Nam, Hanoi.

“Cambodia.” Encyclopædia Britannica, (2020), Encyclopædia Britannica, Inc., www.britannica.com/place/Cambodia.

CCAFS, (2019). Lao PDR. [Online] Retrieved from: https://ccafs.cgiar.org/lao-pdr#.XNkH3dMzboA

Cox Edwards, A. and M. Ureta, (2003), International Migration, Remittances and Schooling: Evidence from El Salvador. Journal of Development Economics 72 (3): 429–61.

Cyril Caminade, Sari Kovats, Joacim Rocklov, Adrian M. Tompkins, Andrew P. Morse, Felipe J. Colón-González, Hans Stenlund, Pim Martens, and Simon J. Lloyd, (2013), Impact of climate change on global malaria distribution, PNAS March 4, 2014 111 (9) 3286-3291

Davies, G.I.; McIver, L.; Kim, Y.; Hashizume, M.; Iddings, S.; Chan, V., (2015), Water-Borne Diseases and Extreme Weather Events in Cambodia: Review of Impacts and Implications of Climate Change. Int. J. Environ. Res. Public Health, 12, 191-213.

D’Agostino, A.L., Sovacool, B.K., (2011), Sewing climate-resilient seeds: implementing climate change adaptation best practices in rural Cambodia. Mitig Adapt Strateg Glob Change 16, 699–720

Deressa, T. et al., (2009), Assessing household vulnerability to climate change: The Case Of Farmers In The Nile Basin Of Ethiopia. Washington, DC: International Food Policy Research Institute

Dervisevic, Ervin; Garz, Seth Aaron Levine; Mannava, Aneesh; Perova, Elizaveta, (2020), How Do Village Heads Make Targeting Decisions for Workfare Programs? (English). Washington, D.C. : World Bank Group

Diana F. Jyoti, Edward A. Frongillo, Sonya J. Jones, (2005), Food Insecurity Affects School Children's Academic Performance, Weight Gain, and Social Skills, The Journal of Nutrition, Volume 135, Issue 12, December 2005, Pages 2831–2839

Education Development Center, (2020), A Radio-Based Approach to Learning during COVID-19, EDC Website, Retrieved from: https://www.edc.org/radio-based-approach-learning-during-covid-19

Edward B. Barbier (2015), Climate Change Impacts on Rural Poverty in Low-Elevation Coastal Zones, Policy Research Working Papers

Frawley, J., (2019). Strategic Evaluation Report Education for Ethnic Minorities Program: Cambodia (pp. 1-63, Rep.). Sydney, New South Wales, Retrieved from: http://careevaluations.org/wp-content/uploads/Cambodia-EEM-strategic-evaluation-report-FINAL-20191114.pdf

Government of Lao PDR, (2018), Post-Disaster Needs Assessment 2018 Floods, Lao PDR,

Vientiane Government of Lao People's Democratic Republic

Hai, Vu Minh, (2012), Climate change, gender and migration. Oxfam presentation in Proceedings of Workshop: Climate Change Adaptation and Migration in the Mekong Delta (CTU, IOM and UNDP). Can Tho University

Hanson, G. H. and C. Woodruff, (2003), Emigration and educational attainment in Mexico. Mimeograph, University of California at San Diego.

Hearn, G. J., Hunt, T., Aubert, J., Howell, J., & Chigira, M., (2008), Landslide impacts on the road network of Lao PDR and the feasibility of implementing a slope management programme. In International Conference on Management of Landslide Hazard in the Asia-Pacific Region, Sendai, Japan

Heather Randell, Clark Gray, (2019), Climate change and educational attainment in the global tropics. Proceedings of the National Academy of Sciences.

Henry, G. T., & Redding, C., (2020), The consequences of leaving school early: The effects of within-year and end-of-year teacher turnover. Education Finance and Policy, 15(2), 332-356.

Hoffmann R, Blecha D., (2020), Education and Disaster Vulnerability in Southeast Asia: Evidence and Policy Implications. Sustainability. 2020; 12(4):1401.

Hunsberger, Carol, et al., (2018), "Linking Climate Change Strategies and Land Conflicts in Cambodia: Evidence from the Greater Aural Region." World Development, vol. 108, 2018, pp. 309–320.

Huu Trang, (2016), Hội nghị tổng kết công tác phòng chống thiên tai và tìm kiếm cứu nạn tỉnh Hòa Bình. (Report on the practice of disaster preparedness and search-and-rescue in Hoa Binh province.) Retrieved from http://baohoabinh.com.vn

I. Schad, P. Schmitter, C. Saint - Macary, A. Neef, M. Lamers, L. Nguyen, T. Hilger, V. Hoffmann, (2011), Why do people not learn from flood disasters? Evidence from Vietnam's northwestern mountains. Nat. Hazards, 62 (2) (2011), pp. 221-241

IPCC, (2020), Special Report on Food Security, Retrieved from: https://www.ipcc.ch/srccl/chapter/chapter-5/

J. Rigg, (2005), Living with transition in Laos: Market integration in Southeast Asia, Routledge

J. Rigg, (2006), Forests, marketization, livelihoods and the poor in the Laos, Land Degradation and Development, 17, pp. 123-133

Jacobson, C., Crevello, S., Chea, C. et al., (2019), When is migration a maladaptive response to climate change?. Reg Environ Change 19, 101–112.

Jamieson NL, Cuc LT, and Rambo AT., (1998), The development crisis in Vietnam's mountains. Special reports number 6. East-West Center, Honolulu, Hawaii. p 32

Jeanne Brooks-Gunn and Greg J. Duncan, (1997), The effects of poverty on children, The

future of children, Vol. 7, No. 2, Children and Poverty (Summer - Autumn, 1997), pp. 55-71

Jha J., Maithreyi R. Ketaki P., S. Pandey and Madhusudan BVR (2018), The Right Start – Investing in the Early Years of Education, CBPS, Save the Children, New Delhi

Kousky C., (2016), Impacts of natural disasters on children. Futur Child. 2016;26(1):73–92. Retrieved from: https://files.eric.ed.gov/fulltext/EJ1101425.pdf

Kuehn, L., & McCormick, S., (2017). Heat Exposure and Maternal Health in the Face of Climate Change. International journal of environmental research and public health, 14(8), 853. Retrieved from: https://doi.org/10.3390/ijerph14080853

Lao People's Democratic Republic, (2004), Decree On the Agreement and Endorsement of the National Strategy on Environment Education and Awareness to the years 2020 and Action Plan for the years 2006-2010.

Lao People's Democratic Republic, (2015), Natural Resources and Environment Strategy, 10 Years 2016-2025.

Lao People's Democratic Republic, (2015), National Biodiversity Strategy and Action Plan 2016-2025

Lao Statistics Bureau, (2016), Results of Population and Housing Census 2015. Lao Statistics Bureau. [online] Retrieved from: http://ec2-54-210-230-186.compute-1.amazonaws.com/wp-content/uploads/2016/11/Lao-Population-census.pdf.

Law, I. et al., (2015), The first national tuberculosis prevalence survey of Lao PDR (2010–2011). Tropical Medicine and International Health, 20(9).

Leary, (2007), Climate Change and Vulnerability and Adaptation: Two Volume Set

Liu, L., H. L. Johnson, S. Cousens, J. Perin, S. Scott, J. E. Lawn et al., (2012), 'Global, regional, and national causes of child mortality: An updated systematic analysis for 2010 with time trends since 2000'. Lancet, 379 : 2151–2161.

Lohmann Steffen; Lechtenfeld Tobias, (2015), The Effect of Drought on Health Outcomes and Health Expenditures in Rural Vietnam, World Development Volume 72, Pages 432-448

Louise S.L. Teh, Natachia Bond, Krishna KC, Evan Fraser, Ratha Seng, U. Rashid Sumaila, (2019), The economic impact of global change on fishing and non-fishing households in the Tonle Sap ecosystem, Pursat, Cambodia, Fisheries Research,Volume 210, Pages 71-80

McKenzie, D.J., (2006), Beyond Remittances: the Effects of Migration on Mexican Households. In International Migration, Remittances and the Brain Drain, ed. C. Özden and M. Schiff, 123-148. Washington, DC: World Bank

Michael Berlemann & Thi Xuyen Tran, (2020), Climate-Related Hazards and Internal Migration Empirical Evidence for Rural Vietnam, Economics of Disasters and Climate Change volume 4, pages 385–409

Montenegro, Claudio E.; Patrinos, Harry Anthony, (2014), Comparable Estimates of Returns to Schooling Around the World. Policy Research Working Paper;No. 7020. World Bank

Group, Washington, DC.

Mook Bangalore, Andrew Smith & Ted Veldkamp, (2018), Exposure to Floods, Climate Change, and Poverty in Vietnam, Economics of Disasters and Climate Change volume 3, pages 79–99.

Montenegro, Claudio E.; Patrinos, Harry Anthony, (2014), Comparable Estimates of Returns to Schooling Around the World. Policy Research Working Paper;No. 7020. World Bank Group, Washington, DC.

Mosel, I. and Jackson, A., (2013), 'Sanctuary in the city? Urban displacement and vulnerability in Peshawar, Pakistan'. Humanitarian Protection Group, Working Paper.

Nenova-Knight, P., (2011), Children and Climate Change in Mongolia: Children's vulnerability and their capacity as agents for community-based adaptation, UNICEF, Bangkok.

Ngo Thanh Son & Nguyen Duy Binh, (2020), Predicting Land Use and Climate Changes Scenarios Impacts on Runoff and Soil Erosion: A Case Study in Hoa Binh Province, Lower Da River Basin, Northwest Vietnam, Environment Asia . May2020, Vol. 12 Issue 2, p67-77

Nguyen Thi Lan Huong, Yao Shun Bo, Shah Fahad, (2019), Economic impact of climate change on agriculture using Ricardian approach: A case of northwest Vietnam, Journal of the Saudi Society of Agricultural Sciences Volume 18, Issue 4, October 2019, Pages 449-457

Nuorteva, Paula, et al., (2010), "Water, Livelihoods and Climate Change Adaptation in the Tonle Sap Lake Area, Cambodia: Learning from the Past to Understand the Future." Journal of Water and Climate Change, vol. 1, no. 1, 2010, pp. 87–101.

Olivier Joffre, (2014), Mekong ARCC Climate Change Impact and Adaptation Study on Agriculture. Prepared for the United States Agency for International Development by ICEM - International Centre for Environmental Management

Olson, Kenneth R., and Lois Wright Morton, (2018), "Tonle Sap Lake and River and Confluence with the Mekong River in Cambodia." Journal of Soil and Water Conservation, vol. 73, no. 3, 2018.

Patz, J. A., Epstein, P. R., Burke, T. A., & Balbus, J. M., (1996). Global climate change and emerging infectious diseases. JAMA, 275(3), 217–223.

Petr Havlík, Hugo Valin, Mykola Gusti, Erwin Schmid, David Leclère, (2015), Climate Change Impacts and Mitigation in the Developing World: An Integrated Assessment of the Agriculture and Forestry Sectors, Policy Research Working Papers.

Pham Thi Kim Phung, (2012), Impact of climate change on rice production in Vietnam, Retrieved from: https://www.geospatialworld.net/article/impact-of-climate-change-on-rice-production-in-vietnam/

Pimhidzai, Obert; Tong, Kimsun; Cesar, Andres Manuel; Arayavechkit, Tanida; Tsimpo Nkengne, Clarence, (2020), Lao People's Democratic Republic Poverty Assessment 2020 :

Catching Up and Falling Behind (Vol. 2) : Overview (English).

Revati K. Phalkey, Clara Aranda-Jan, Sabrina Marx, Bernhard Höfle, and Rainer Sauerborn, (2015), Systematic review of current efforts to quantify the impacts of climate change on undernutrition, PNAS 112 (33) E4522-E4529

Rossi, Andrew, (2008), The Impact of Migration on Children in Developing Countries, Harvard, Working Paper

Royal Government of Cambodia, (2013), Climate Change Strategic Plan 2014-2023, Retrieved from: https://ncsd.moe.gov.kh/resources/document/cambodia-climate-change-strategic-plan-2014-2023-cccsp-2014-2023en

Royal Government of Cambodia, (2016), Climate Change Action Plan 2016-2018, Retrieved from: https://ncsd.moe.gov.kh/sites/default/files/2019-08/KM%20Framework%20for%20CC%20Response_Part2-Proposed%20Action%20Plan_2016_en.pdf

Royal Government of Cambodia, (2019), Mid-term review of Cambodia Climate Change Strategic Plan 2014-2023, Retrieved from: https://ncsd.moe.gov.kh/sites/default/files/2019-08/CCCSP%20MTR_Final%20Evaluation%20Report_final_cleared.pdf

Sarah M Martin, Kai Lorenzen, (2016), Livelihood Diversification in Rural Laos, World Development Volume 83, Pages 231-243

Save the Children, (2020), Innovations used in the advancing of the Right to Read Programme in Rwanda, A learning paper, Retrieved from: https://resourcecentre.savethechildren.net/node/17299/pdf/innovation_paper_final.pdf

SERC, (2008), A Comparative Picture of Migration in Laos, Myanmar, Cambodia, Vietnam and Thailand: Summary. Social Environmental Research Consultant.

SRD (Sustainable Rural Development), (2011), Sustainable livelihoods that can respond to climate change in the Northern mountainous region of Vietnam. Summary report. Centre for Sustainable Rural Development, Hanoi. p 39

Sudharshan Canagarajah & Harold Coulombe, (1999), Child Labor and Schooling in Ghana, World Bank, Retrieved from: https://doi.org/10.1596/1813-9450-1844

Tamiru, D., Belachew, T., (2017), The association of food insecurity and school absenteeism: systematic review. Agric & Food Secur 6, 5

T.B. Below, K.D. Mutabazi, D. Kirschke, C. Franke, S. Sieber, R. Siebert, K. Tscherning, (2012), Can farmers' adaptation to climate change be explained by socio-economic household-level variables? Global Environ. Chang., 22 (2012), pp. 223-235

T. Reardon, J.E. Taylor, K. Stamoulis, P. Lanjouw, A. Balisacan, (2000), Effects of non-farm employment on rural income inequality in developing countries: An investment perspective, Journal of Agricultural Economics, 51, pp. 266-288

Tingyeh Wu *, Hung-Ju Shih, Hsin-Chi Li, Yuan-Fong Su, and Yung-Ming Chen, (2015), Landslide Impact Assessment Using Projection Rainfall Data from Climate Change

Scenario, Terr. Atmos. Ocean. Sci., Vol. 27, No. 5, 729-740

Tuong Duy Kien, Nguyen Thi Lan, (2020), Responding To Environmental Degradation And Climate Change To Ensure Livelihoods For Ethnic Minorities In Vietnam Today, International Research Journal, Issue № 04(94) April 2020, 126-131

Upadhyay, R.P., Naik, G., Choudhary, T.S. et al, (2019), Cognitive and motor outcomes in children born low birth weight: a systematic review and meta-analysis of studies from South Asia. BMC Pediatr 19, 35. Retrieved from:https://doi.org/10.1186/s12887-019-1408-8

U.S. Library of Congress, Laos Geography, (2020), Retrieved from: http://countrystudies.us/laos/44.htm

UN Mongolia Country Team, (2010), 'Dzud Appeal,' Office for the Coordination of Humanitarian Affairs.

UN, (2014), Migration, Resettlement and Climate Change in Vietnam, Retrieved from: https://www.undp.org/content/dam/vietnam/docs/Publications/Migration%20&%20Climate%20change%20-%20Eng.pdf

UNDP, (2014), Strengthening the Governance of Climate Change Finance, Retrieved from: https://www.climatefinance-developmenteffectiveness.org/sites/default/files/documents/10_02_15/Cambodia_CCFF_Summary_as_27Oct2014_for_CRBWS.pdf

UNDRR, (2020), Sendai Framework for Disaster Risk Reduction 2015–2030. Retrieved from: https://www.undrr.org/

UNESCO Bangkok, (2015), Climate Change Vulnerability Mapping for Greater Mekong Sub-region, Retrieved from: https://www.researchgate.net/profile/Quan_Dau2/publication/319151979_Climate_Change_Vulnerability_Mapping_for_Greater_Mekong_Sub-region/links/59952811458515c0ce662e92/Climate-Change-Vulnerability-Mapping-for-Greater-Mekong-Sub-region.pdf

UNESCO, (2020), Learning through radio and television in the time of COVID-19, UNESCO Website, Retrieved from: https://en.unesco.org/news/learning-through-radio-and-television-time-covid-19

Unicef & Lao Cai People's Committee Provincial Child-Friendly Project, (2016), Report On Situation Analysis Of Children In Lao Cai, Retrieved from https://www.unicef.org/vietnam/media/1426/file

UNICEF, (2011), Children's Vulnerability to Climate Change and Disaster Impacts in East Asia and the Pacific, Retrieved from: https://www.unicef.org/media/files/Climate_Change_Regional_Report_14_Nov_final.pdf

UNICEF, (2017), Laos Education Retrieved from: https://www.unicef.org/laos/education

UNICEF Cambodia, (2020),"Education.", Retrieved from: www.unicef.org/cambodia/education.

UNICEF, (2020), Continuous Learning during COVID-19, Retrieved from: https://www.unicef.org/cambodia/stories/continuous-learning-during-covid-19

United Nations, Department of Economic and Social Affairs (UNDESA) & International Veronica Houser (2020), UNICEF, Radio learning in the time of Coronavirus, UNICEF Website, Retrieved from: https://www.unicef.org/rwanda/stories/radio-learning-time-coronavirus

UN, (2017), Migrant Stock: The 2017 Revision. Retrieved from: http://www.un.org/en/development/desa/population/migration/data/estimates2/estimates17.shtml

Vally Koubi; Gabriele Spilker; Lena Schaffer; Thomas Bernauer, (2016), Environmental Stressors and Migration: Evidence from Vietnam, World Development Volume 79, Pages 197-210

Viet Nam Government, (2012), National Green Growth Strategy

Viet Nam Government, (2013), Intended Nationally Determined Contribution of Viet Nam, Retrieved from: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Viet%20Nam%20First/VIETNAM'S%20INDC.pdf

Vietnam Ministry of Planning and Investment, (2014), Financing Vietnam's Response to Climate Change: Building a Sustainable Future, Retrieved from: https://www.worldbank.org/content/dam/Worldbank/document/EAP/Vietnam/CPEIR_Brochure_English_Small.pdf

Vietnam Government (2018), Viet Nam's Voluntary National Review On The Implementation Of The Sustainable Development Goals, Retrieved from: https://sustainabledevelopment.un.org/content/documents/19967VNR_of_Viet_Nam.pdf

Viriyasack Sisouphanthong, Terukazu Suruga & Phouphet Kyophilavong, (2020), Valuation of incentives to recruit and retain teachers in rural schools: Evidence from a choice experiment in Cambodia and Laos, Cogent Education, 7:1, 1724243

Vongpaphane Manivong, (2014), Agrarian Transition in Lowland Southern Laos: Implications for Rural Livelihoods, University of Queensland

Vorasan, N., Pan-Ngum, W., Jittamala, P., Maneeboonyang, W., Rukmanee, P., & Lawpoolsri, S., (2015), Long-term impact of childhood malaria infection on school performance among school children in a malaria endemic area along the Thai-Myanmar border. Malaria journal, 14, 401., Retrieved from: https://doi.org/10.1186/s12936-015-0917-7

Warner K., Afifi T., Kalin W., Leckie S., Ferris B., Martin S.F and Wrathall D., (2013), 'Changing Climate and Moving People: Framing Migration, Displacement and Planned Relocation'. Policy Brief No 8. Bonn: United Nations University Institute for Environment and Human Security (UNU-EHS)..

World Bank, (2016), Reducing Early Grade Drop Out And Low Learning Achievement In Lao PDR, Retrieved from:

http://documents1.worldbank.org/curated/en/161641483590757065/pdf/111627-REVISED-PUBLIC-Lao-PDR-Root-Causes-of-Early-School-Leaving-f.pdf

Woldehann T, Mekonnen A, Jones N, (2008), Education choices in Ethiopia: what determines whether poor households send their children to school?, Ethiopian Journal of Economics, Vol 17, No. 1

World Bank Group, (2019), Climate Change Knowledge Portal Country Laos, Retrieved from: https://climateknowledgeportal.worldbank.org/country/laos/climate-data-projections

World Bank, (2020), “Cambodia Overview.”, Retrieve from: www.worldbank.org/en/country/cambodia/overview.

Woldehann T, Mekonnen A, Jones N, (2008), Education choices in Ethiopia: what determines whether poor households send their children to school?, Ethiopian Journal of Economics, Vol 17, No. 1

XinHua, (2018), Laos faces food security challenges after extreme weather, Retrieved from: http://www.xinhuanet.com/english/2018-09/12/c_137462724.htm

Yue Ai, Shi Yao Jiang, Luo Renfu, Jamie Chen, James Garth, (2017), China’s Invisible Crisis: Cognitive Delays among Rural Toddlers and the Absence of Modern Parenting, The China Journal Volume 78

Yongyut Trisurat, Aekkapol Aekakkararungroj, Hwan-ok Ma & John M. Johnston, (2017), Basin-wide impacts of climate change on ecosystem services in the Lower Mekong Basin, Ecological Research volume 33, pages 73–86.