

Enhancing Resilient Livelihoods to Address the Climate Change, Disaster and Poverty Nexus in Myanmar

act:onaid



Food and Agriculture
Organization of the
United Nations

List of Acronyms

| | |
|---------|--|
| ABD | Asian Development Bank |
| BOBLME | Bay of Bengal Large Marine Ecosystem |
| CBDM | Community Based Disaster Management |
| CBO | Community Based Organisation |
| CSO | Central Statistical Organisation (Ministry of Finance and Planning) |
| DFID | Department for International Development |
| DRR | Disaster Risk Reduction |
| FPIC | Free, Prior and Informed Consent |
| FAO | Food and Agriculture Organisation of the United Nations |
| FESR | Framework for Economic and Social Reforms |
| FGD | Focus Group Discussion |
| FPIC | Free, Prior and Informed Consent |
| GDP | Gross Domestic Product |
| INDC | Intended Nationally Determined Contribution |
| INGO | International Non-Government Organisation |
| IOM | International Organisation for Migration |
| IPCC | Intergovernmental Panel on Climate Change |
| IWMI | International Water Management Institute |
| JICA | Japanese International Cooperation Agency |
| KII | Key Informant Interviews |
| LIFT | Livelihoods and Food Security Trust Fund |
| MAPDRR | Myanmar Action Plan on Disaster Risk Reduction |
| MCCA | Myanmar Climate Change Alliance |
| MCCR | Myanmar Consortium for Community Resilience |
| MIMU | Myanmar Information Management Unit |
| MoECF | Ministry of Environment, Conservation and Forestry (previously MoNREC) |
| MoNREC | Ministry of Natural Resources and Environmental Conservation |
| MSWRR | Ministry of Social Welfare, Relief and Resettlement |
| NAPA | National Adaption Program of Action (Climate Change) |
| NDMC | National Disaster Management Committee |
| NECC | National Environmental Conservation Committee |
| NGO | Non-Government Organisation |
| PCVA | Participatory Capacity and Vulnerability Assessment |
| PWC | PricewaterhouseCoopers |
| RSM | Rapid Situation Monitoring |
| SDG | Sustainable Development Goals |
| UNEP | United Nations Environment Programme |
| UNDP | United Nations Development Programme |
| UNDPHDI | United Nations Development Programme Human Development Initiative |
| UNDRR | United Nations Office for Disaster Risk Reduction |
| UNICEF | United Nations Children's Fund |
| UNISDR | United Nations International Strategy for Disaster Reduction |
| UNOCHA | United Nations Office for the Coordination of Humanitarian Affairs |
| USGS | United States Geological Survey |
| VDMC | Village Disaster Management Committee |
| WFP | World Food Programme |
| WHO | World Health Organisation |

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Executive Summary

A research study was commissioned by the Food and Agriculture Organisation of the United Nations, to be undertaken by ActionAid Myanmar to contribute to the information available on the complex problem of the nexus of poverty, climate change and disasters in Myanmar. The author was engaged to finalise and interpret the findings of the research, undertake the literature review and compose this report.

The research format and methodology were framed to gain information to answer ten key questions and from this generate findings and recommendations applicable to the research study areas, and for consideration in program design and implementation in other similar areas in Myanmar, and for comparison and integration into similar studies commissioned in Vietnam and Cambodia. The ten questions sought to identify if the nexus was acknowledged in government policy and design documents; identify the impacts of the nexus on the poorest and most vulnerable; identify any programs that were currently addressing the nexus successfully and could be replicated in other areas; identify what programs if any to address the nexus were already operating in the study area; and if any current programs in the study areas could be reformatted to address the nexus more efficiently.

The research used a qualitative methodology in the field, supplemented by secondary data at the township level, an extensive literature review and a consultation workshop of 40 relevant actors from the all levels of government and the INGO and NGO sectors to collaborate or challenge the preliminary findings held in Naw Pyi Taw on 10th April 2018.

All findings and associated recommendations from the research have been screened to ensure validity and applicability using the following criteria.

- Only information obtained at the village level that could be cross validated from three independent sources in the field was considered applicable for inclusion.
- Only information gained at the village level that was cross validated by those present at the consultation workshop, or through the literature review was considered applicable to be stated as a finding and to inform recommendations from the research.
- Only comments from those present at the consultation workshop that was relevant to the village level findings and could be supported by the literature review was included.

The wealth, economy, and society of Myanmar is defined by, and highly dependent on the environment, natural resources, climatic conditions and the health of the eco-system. Due to the geographic location and geo-morphology of the country, Myanmar is and will continue to be regularly exposed to a series of natural events with potentially severe negative impacts.

Myanmar ranks second on the climate risk index of the most at risk countries for long term climate risks with 41 recorded events and the highest overall death toll. Myanmar has also remained in the top three most affected countries continuously over the previous two decades. Due to the geographic location, Myanmar continues to be at a high risk of severe and extreme hydro-metrological events including cyclones, widespread flooding and extreme rainfall events that cause massive soil erosion, and landslides. Climate change and disaster events are also becoming increasingly interrelated, the mutually reinforcing relationship between climate change and disasters is growing stronger and for all practical purposes are becoming inseparable.

Large-scale hydro-meteorological disaster events are being preceded or followed by smaller scale long onset hydro-meteorological events such as those being consistently reported in the research study areas, this increases vulnerability and decreases adaptive and recovery capacity and recourses. The recovery from major events is also becoming more difficult as increasingly 'things do not return to normal' after an event, as what is normal is shifting, due to climate change. This was very evident from the village and township level reports in all areas of the research study.

From a global perspective hydro-metrological disaster events such as storms, heavy rainfall events, floods and the associated landslides which Myanmar experiences, account for over 90 percent of deaths from all disasters and are the single largest cause of disaster related infrastructure and resource destruction. Climate change increases the intensity and frequency of extreme hydro-meteorological events and is also increasingly the principle driver behind slow onset disasters such as drought, and the associated rapid onset disaster events such as heatwaves and extreme heat spikes reported in the research study areas.

The research study established that poverty and the associated low socio-economic status of people living in poverty have a direct inverse relationship on how individuals, groups and communities will be affected by climate change and disasters. The greater the poverty and lower the socio-economic status of individuals the more they are affected by natural and man-made disaster events and climate change. People living in poverty also have less ability to recover from these events and less ability to safeguard against the effects of future disaster and climate change events, which is exacerbated by the large income disparity in Myanmar.

Myanmar ranks 145 out of 188 countries in human development, on the UN Human Development index and in 2016 had one of the widest income disparities in the world. Nationwide, poverty has fallen from 48 percent in 2005 to 32.1 percent in 2015, although poverty nationally is declining, poverty is becoming more defined by geographic area and occupation, with poverty ratings the highest in the coastal agricultural zone at 53.1 percent, with a further 40 percent of the population living under the near poverty line, placing them in an extremely vulnerable situation. In this wider context, not only is climate change a vulnerability, but climate change causes a multiplier effect on existing vulnerabilities and the potential impact of disaster events.

Also, the climate change, disaster and poverty interaction should not be viewed as a linear relationship, but as a circular interaction, climate change is driving the frequency and severity of disasters, but also disasters which may or may not be caused by climate change are having a greater and longer lasting affect due to climate change. Cyclone Nargis is an example where the discussion about whether the event was caused by climate change or not, is largely irrelevant. What we do know is that the damage to the foreshore of the delta, paddy fields, mangrove forests, freshwater and saltwater fish stocks and fish breeding habitats caused by Nargis has been exacerbated in the decade since the event by climate change, and the poorest are those most adversely affected. The interaction of climate change and disasters will affect the poorest and most vulnerable in two primary ways.

Firstly, by increasing the frequency and severity of extreme weather events and by increasing the overall vulnerability of poorer communities to these hazards through factors such as long-term ecosystem degradation, reductions in water and food availability, reduction of natural resources, reduction in the viability of agriculture livelihoods and the associated social disruption. Secondly, climate change including increases in temperature, changes in total rainfall and rainfall patterns, a decrease in the duration of the monsoon season and an increase in the frequency and severity of extreme weather events all increase the vulnerability of Myanmar and particularly its poorer residents to the impacts of disaster events.



Validity of the findings from the research

The findings and associated recommendations from the research should be considered valid due to the cross corroboration of the findings across a minimum of two of the three sectors. Only village level information that could be corroborated from three independent key person interviews or focus group discussion sources was considered for inclusion. Any information that was validated and was considered for inclusion also needed to be supported by the findings in an extensive literature review and/or consensus agreement from the consultation workshop¹. The consultation workshop was convened to present and discuss the preliminary findings with a range of people that were not in any

¹ Presentation of preliminary findings and consultation workshop held in Nay Pyi Taw on 10 April 2018.

way associated with the research study but had knowledge of the subject and geographic location. Including representatives from the relevant government departments such as fisheries, agriculture and administration, township level government program managers and representatives from the INGO and NGO sectors working in the relevant geographic and thematic areas.

Through this rigorous screening of information, the research will contribute to increasing the understanding of the climate change, disaster and poverty nexus with consideration to the limitations imposed by the size of the study. The principle contributions are validated and corroborated village level perceptions of what is taking place, specific examples of each phenomena and possible solutions.

Notwithstanding this, due to the small sample size of the research, the wide diversity of the topography and level of development in Myanmar, the findings should only be considered directly applicable to the research study areas. Although the findings of the study should also be considered indicative for areas with similar topography and conditions and should be reviewed for consideration to inform program design and implementation in similar areas. The outcomes of the current research can also be used to inform more detailed and specific further research.

Synopsis of the principal findings of the nexus research study

Synopsis of enablers to addressing the nexus

The research clearly established that although the language and terminology varied, the nexus between climate change, disasters and poverty was acknowledged by senior levels of government in Myanmar and was clearly articulated in a range of strategy, policy and leadership documents composed by the Government of Myanmar from 2012 to the present. Several ministries of the Government of Myanmar in conjunction with internationally respected organisations have issued extensive documents that are intended to guide program design and implementation by the relevant departments within the government, the INGO sector when implementing development programs and Myanmar NGOs in village environments.

The research also clearly established that although the terminology once again varied, the nexus was known and accepted as requiring attention by government officers responsible for program management at the township level. Was known and accepted as requiring attention by program managers at the township and village in the INGO and NGO sectors and was recognised, known, experienced and validated by those involved in the research study at the village level.

Synopsis of how does the nexus effects communities and individuals

Those living in poverty are less well educated and therefore less able to analyse and interpret information, this limited ability to plan and implement effective disaster risk reduction strategies impedes preventative measures. Predominately, the climate change knowledge of people living in poverty is based more on hearsay information and less on factual information therefore their ability to plan for and recover from an event appropriately is constrained. The consequence of their low socio-economic status is they have less contact and less influence with persons in positions of authority and power and thus they are less able to advocate for disaster and climate change event preparedness infrastructure, and strategies for planning and recovery in their areas.

People living in poverty also have fewer employment options and are often 'trapped' in the default employment into which they were born. They have less ability to change their employment through education gaining due to lack of opportunities. And, there are fewer life style choices due to having less disposable income, lower education and having to devote greater percentage of time, energy, effort and funds to generating sufficient income to meet basic needs.

Due to having a lower overall income and lower disposable income, people living in poverty are required to commit all available funds to generating income. In agricultural communities this could be by buying more seed, more fertiliser, or purchasing more assets, such as leasing land, or purchasing cows or machinery to work the fields. In this context the loss of a single significant asset due to a

disaster or climate change event can be life changing for those living in poverty and set in motion a chain of events which will eventually cause them to progressively lose more assets, until they lose their principle asset, their land.

The ability of people living in poverty to change the work they do is also very low, and if they wish to change, it almost always requires the person to leave the area in which they live and move to another district, state, or country. As those most likely to move are the younger, stronger and fitter generation, this reduces the seasonal labour pool. Although there are reports that the remittances of those working abroad have benefited some families in the study areas, the availability of labour to assist in peak agricultural periods of planting and harvest is significantly reduced. This causes those that remain, which are predominantly females with children, the elderly and the very young to work more often, longer hours per day and longer into old age. There is also an increase in the number of females with children becoming the head of the household and having a greater range of duties and responsibilities placed upon them.

Those living in poverty tend to live in areas more prone to the effects of climate change because the areas are less desirable and therefore cheaper, and these areas are less **disaster and climate change event prepared**. Dwellings are a reflection of socio-economic status and the availability of funds; hence they are of lower quality and structurally less robust. The dwellings are therefore less able to withstand disaster events and the ability of those living in poverty to recover from an event is less, due to higher level of damage and lower availability of funds to repair or replace what was damaged or lost due to the event.


Over a period of years, the interplay of all these factors leads to people living in poverty being heavily impacted by **disaster and climate change events** and having little or no ability to change their life circumstances to prevent further impact. This is leading to them being temporarily and then progressively permanently displaced due to disaster and climate change events. Due to having little or no choice where to move, there are more people squatting on unimproved natural areas such as forests and on the outskirts of towns and cities. This inevitably leads to friction with the local residents, as the newly arrived residents are using food and shelter resources that were previously available only to the local residents.

Synopsis of the **individual components** **contributing to the nexus**

The current impacts of climate change and disaster events identified in the research study include strains on water resources for human, agricultural and animal use, public health risks due to water-related diseases, an increase in fungal and respiratory infections and diseases in humans and agricultural animals and heat stress-related distress and deaths affecting vulnerable members of the community and smaller agricultural animals. Forestry is threatened due to destruction by tropical cyclones, strong winds, and floods in addition to human related pressure to supplement lost agricultural income. Coastal systems face threats from rising sea surface temperatures leading to increases in cyclone incidence and intensity and associated strong winds and high storm surges, decreased fisheries production and salt water intrusion into paddy fields in the delta regions.

In the context of high poverty levels, inadequate, inappropriate and disproportionate development, increasing climatic risks, geographic instability and five decades of inadequate funding and support for core social sectors such as health, electricity distribution and road networks, all contribute to the vulnerability and risk for the poor and most vulnerable of the Myanmar population. This poses complex challenges for current and future political and social leaders and administrators to resolve.

Synopsis of the **disproportionate impact on females of the nexus**

More females that live in poverty are killed and more females  **er a greater range of significant injuries in disaster events, due to often occupying the caring role for children and others less able and capable, such as the elderly and being with this group during a disaster event. Following a disaster event, females are more likely to have additional income generation responsibilities such as running**

a shop, weaving or additional farm management responsibilities to supplement the family income placed on them raising their stress levels and lowering their resilience levels.

Females living in poverty are more adversely affected by outward migration due to climate change and disaster events. If they remain in the community, their range of responsibilities increases, including often becoming the de-facto head of the household, in addition to being the primary (often only adult) carer of children the elderly and infirm, in addition to being responsible for the management farm and actively working on the farm. If females choose to migrate to other areas for alternative employment, they are more vulnerable than males to exploitation, particularly if the migration is forced by disaster and climate change events.

Synopsis of the barriers to addressing the nexus

The challenges clearly demonstrate the need for a coordinated approach from all sectors of government, International and National Non-Government Organisations (INGO and NGO) and the for-profit business sector. The research has clearly established that the Government of Myanmar is initiating direction and leadership and providing policy and strategy documents to steer the path of development to address the nexus of poverty alleviation, disaster risk reduction and management and climate change adaption. But, very significant challenges remain, including;

Although the nexus was well known, and from the approximately 40 government, INGO and NGO program managers at the consultation workshop there was consensus on all aspects of the nexus research could not identify any programs that were specifically designed to address the nexus at the township or village level in the target areas. Nor could any of those present at the consultation workshop when asked directly, clearly articulate how any current programs addressed the nexus, or could be adapted to address the nexus. This illustrates that there has been insufficient emphasis given to turning the strategic, policy and leadership documents into township and village level programs. The findings also clearly illustrate that there has been insufficient training delivered to township and village level program managers on how to make minor but potentially significant adaptations to program design to address the nexus more effectively.

Effectively Myanmar is experiencing a 'triple transition period', from an authoritarian military-based governance system to democratic governance, from a centrally directed economy to a market-oriented economy and from 60 years of conflict to future peace in the ethnic border areas. Although there is a willingness to transition, long term government reforms are hampered by the current constitution, the balance of power in the government, and a legacy of five decades of authoritarian rule. All of these factors when viewed in their entirety, put the challenges for Myanmar in dealing with climate change, disaster management and poverty alleviation into perspective.

In the second decade of the 21st century, Myanmar is attempting to simultaneously move from a development country status by achieving the Sustainable Development Goals, meet the United Nations Framework Conventions on climate change, ensure disaster mitigation and preparedness and achieve national building goals as set in Myanmar's Intended Nationally Determined Contribution (2015). Green growth which takes climate change into consideration, requires developing climate resilient, low emission infrastructure and implementing energy efficiency and renewable energy projects. Supported by sustainable transport systems and integrated urban planning, this is a significant challenge for the government in a country with several internal conflicts, high levels of poverty and a low taxation base.

The greatest challenge for Myanmar to reduce the risk of disasters, adapt to climate change and reduce poverty is the competing priorities of development. Loss a great number of sectors simultaneously, including changing the governance structure, finance regulation, taxation, health, education and infrastructure development, particularly roads and electricity generation and distribution.

As the impact of climate change and natural disasters are clearly acknowledged and evident, the greatest challenges facing the country's leadership and policy makers is to achieve sustainable, ecologically responsible development, address financial constraints, and technology and capacity gaps, whilst improving social standards, through job creation, education reform and health sector improvement. Whilst also simultaneously adapting the country to climate change and reducing the risk to people and assets from disasters, particularly hydro-metrological disasters, a certain number of which are inevitable regardless of whatever is planned or implemented, due to the location of the country.

Country Context

Population

Myanmar is an ethnically diverse country with 135 ethnic groups and 108 ethno-linguistic variations officially recognized by the government. The largest is Bamar, estimated to constitute 68 percent of the population, followed by Shan 9 percent, Kayin 7 percent, Rakhine 3.5 percent, Mon 2 percent Kachin 1.5 percent, Kayah 0.75 percent, and Chin less than 0.5 percent. The remaining 127 recognised ethnic groups each constitute less than 0.5 percent of the population and in total account for the remaining 9 percent. The Bamar ethnic group have traditionally occupied the centre of the country, with the other ethnic groups occupying the mountainous periphery.

In 2014, the Myanmar census recorded a total population of 51,486,253 persons, comprising, 24,824,586 males and 26,661,667 females², the World Bank estimated the population had increased to 52,885,223 by 2016, equating to an annual population growth rate of 0.89 per cent, one of the lowest in Southeast Asia (World Bank, 2018). Approximately 66 per cent of the population live in rural areas, 33 percent live in urban areas (Department of Population, 2016), with the majority concentrated in five states and regions, Yangon (7.36 million), Ayeyarwady (6.18 million), Mandalay (6.16 million), Shan (5.82 million) and Sagaing (5.32 million). The least populated states and regions are Kayin (1.57 million), Chin (478,000) and Kayah (286,000). Table 1 provides a snapshot of the distribution of ethnic diversity throughout Myanmar.

| State/Region | Area** (sq km) | Density (people per sq km) | | | | | |
|--------------|-------------------|-------------------------------|-------------------|-------------------|-----------|-----------|-----------|
| | | 1973 | 1983 | 2014 | 1973 | 1983 | 2014 |
| UNION | 676,577.23 | 28,922,802 | 35,315,623 | 51,486,253 | 43 | 52 | 76 |
| Kachin | 89,041.80 | 737,939 | 904,794 | 1,689,441 | 8 | 10 | 19 |
| Kayah | 11,731.51 | 126,574 | 168,429 | 286,627 | 11 | 14 | 24 |
| Kayin | 30,382.77 | 858,429 | 1,055,359 | 1,574,079 | 28 | 35 | 52 |
| Chin | 36,018.90 | 323,295 | 368,949 | 478,801 | 9 | 10 | 13 |
| Sagaing | 93,702.48 | 3,119,054 | 3,862,172 | 5,325,347 | 33 | 41 | 57 |
| Tanintharyi | 43,344.91 | 719,441 | 917,247 | 1,408,401 | 17 | 21 | 32 |
| Bago | 39,404.43 | 3,179,604 | 3,799,791 | 4,867,373 | 81 | 96 | 124 |
| Magway | 44,820.58 | 2,634,757 | 3,243,166 | 3,917,055 | 59 | 72 | 87 |
| Mandalay | 30,888.09 | 3,668,493 | 4,577,762 | 6,165,723 | 99 | 124 | 200 |
| Mon | 12,296.64 | 1,314,224 | 1,680,157 | 2,054,393 | 107 | 137 | 167 |
| Rakhine | 36,778.05 | 1,712,838 | 2,045,559 | 3,188,807 | 47 | 56 | 87 |
| Yangon | 10,276.71 | 3,190,359 | 3,973,626 | 7,360,703 | 310 | 387 | 716 |
| Shan | 155,801.38 | 3,179,546 | 3,716,841 | 5,824,432 | 20 | 24 | 37 |
| Ayeyawady | 35,031.88 | 4,156,673 | 4,994,061 | 6,184,829 | 118 | 142 | 177 |
| Nay Pyi Taw | 7,057.10 | - | - | 1,160,242 | | | 164 |

* Population missed in parts of the country during enumeration added for the 1973, 1983 and 2014 census.

** Areas refers to land surface only, not covered by water.

Table 1 Myanmar population and density by State/Region (Department of Population, 2016).

² Including 1,206,353 persons estimated not to have been counted in the census in parts of Rakhine, Kachin and Kayin.

Gender and age

Females in Myanmar outnumber males by 1.83 million, with the male to female ratio at the Union level being 93. The only State in which males exceeds females is Kachin, with the sex ratio being equal in Kayah and Shan States. The differences in the ratio is attributed to male migration to neighbouring countries for employment and younger higher male mortality, commencing in adolescence.

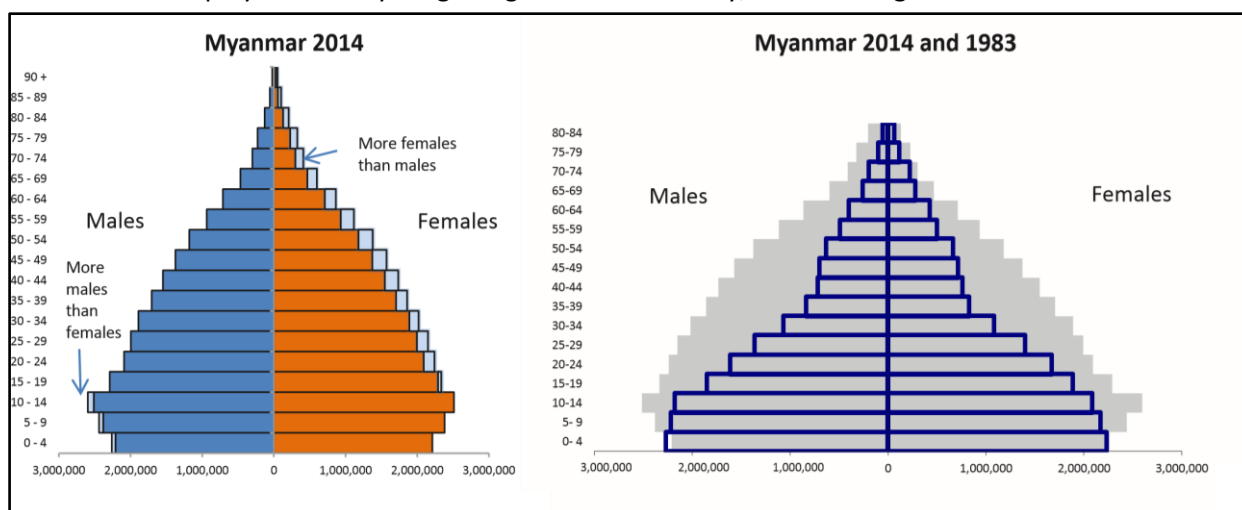


Figure 1 Myanmar population pyramids (Department of Population, 2015)

The population of Myanmar had more children and young people in 1983 than in 2014 as illustrated in Figure 1 population pyramid (Department of Population, 2015). The decrease in the size of the younger generations accelerated approximately 10 years ago as an effect of reduced fertility rates, shown as the reduced number of people in the age groups 0-4 and 5-9 in 2014. The size of the young working age population has been steadily increasing, this is evidence of a demographic transition of reduced youth dependency.

Livelihoods

The income gap in Myanmar is among the widest in the world, as of 2016, Myanmar ranks 145 out of 188 countries in human development on the United Nations Human Development Index. The estimated real growth rate for Myanmar in 2017 was 7.2 percent, with gross domestic product per person USD 6,300, which is an increase from USD 5,900 in 2016 (World Bank, 2018). Growth has not been as strong as expected due to the slower than expected pace of recovery of agriculture from floods in 2015-2016 causing a deceleration of agricultural growth, and a deceleration of industrial output, including food processing, gas production, and construction activity (World Bank, 2016a).

Although 70 percent of the Myanmar's labour force is engaged in the agricultural sector as a percentage of gross domestic product agriculture accounts for only 36 percent, with industry accounting for 35.4 percent, a wide range of other industries including tourism and extractive industries make up the balance (World Bank, 2018). The Annual Labour Force Survey for 2017 recorded only 39.9 percent of all workers as salaried wage earners with 77.7 percent of workers regarded as self-employed or contributing family workers³, this includes the vast majority of the agricultural sector, which are family-based holdings (Department of Labour, 2017).

The economic growth of Myanmar remains susceptible to the risks of low gas export prices, increasing fiscal and trade imbalances and exacerbating financing pressures on the government. Due to a relatively narrow production base, high relative dependence on primary commodities, vulnerability to natural disasters and lack of clarity or delays in policy implementation, with the diversification of livelihoods remaining limited for the immediate future.

³ This is more than 100 percent due to many people having both a salaried job and also family income generating responsibilities

Poverty

Nationwide, the percentage of people living below the poverty line has fallen from 48 percent in 2005 to 32.1 percent in 2015, with a further 40 percent of the population living under the near poverty line, equating to 72 percent living in or very vulnerable to poverty (Ministry of Planning and Finance, 2018). Although poverty nationally is declining, poverty is becoming more defined by geographic area and occupation, with poverty in rural agricultural areas almost twice the national average at 70 percent (Department of Population, 2015). When these figures are analysed, it becomes clear that the vast majority of people living in rural agricultural areas, either live in poverty, or live with the constant threat of falling into poverty.

Myanmar, as a signatory to the Sustainable Development Goals (SDG) in 2015, was able to provide reporting on 60 percent of the 17 goals and 169 targets in August 2017. According to the reporting, the average daily earnings of employees in 2015 was 4,760 MMK (USD 3.53⁴) with the average daily earnings of men 1,300 MMK (USD 0.97) higher than the daily earnings of women with 9 percent of the population living below half the medium expenditure of 815 MMK (USD 0.60) a day. The SDG report showed 41 percent of the population living in urban slums (world average is 29.7 percent) and the proportion of population with electricity access being 33.3 percent (world average is 84.7 percent) (Central Statistical Organisation (CSO) and UNDP, 2017). These situations are particularly common in rural areas where 44 percent of older persons have no electricity and 63 percent have no running water.

Within Myanmar, a large number of the population remain economically active up to a high age, not by choice but due to poverty and deprivation. Of those aged between 65 and 69, 62.5 percent of males and 31.5 percent of females are still engaged in the labour force, of those aged 80 and over 14.7 percent of males and 8.2 percent of females were economically active (Soe, 2017). In Myanmar, adult children are the most common source of material support for older persons, with over 80 percent of older persons reporting receiving some type of material support from children.

Nutrition

Reporting on the Sustainable Development Goals, Myanmar advises 14.2 percent malnourishment

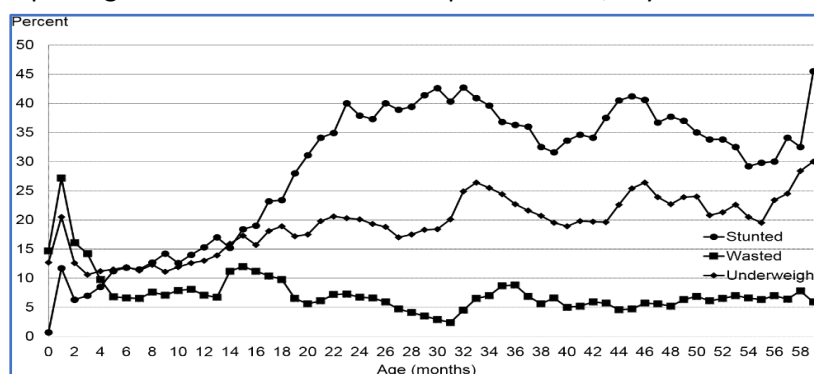


Figure 2 Nutritional status of children by age

(world average 10.8 percent), stunting of children under 5 at 29.2 percent (world average 23.8 percent) (CSO and UNDP, 2017), with an additional 7 percent wasted (thin for their height) and 19 percent underweight (thin for their age) as illustrated in Figure 2. Minimum acceptable dietary standards for children aged 6 to 23 months is only achieved

in 16 percent of children in Myanmar. Further data indicates that only 56.5 percent of children aged 6 to 11 months are being adequately fed, as anaemia among children has been recorded as high as 72 percent (Sagiang State), with 47 percent of females aged 15 to 49 also anaemic. A clear correlation has been demonstrated between low levels of female literacy in rural areas currently 40.2 percent and the likelihood of child stunting, childhood anaemia, and anaemia in females of child bearing age (Ministry of Health and Sport, 2016).

Access to safe water, safe sanitation and hygiene also contributes to poor outcomes with a child mortality rate of 10.4 compared to the South East Asia rate of 4.0 (CSO and UNDP, 2017).

⁴ Based on <https://www.oanda.com/currency/converter/>

Health

Poor health is the single most common shock to income and family welfare reported by households in Myanmar, with out of pocket health expenditures high, and the number of days of labour lost significant, placing a large dual burden on households (Ministry of Health, 2016). Myanmar has high under 5 mortality rates at 50 per 1,000 live births (world rate 42.5), high preventable disease rates with 369 per 1,000 incidences of tuberculosis (world rate 33). Morality rates for cardiovascular disease, cancer, diabetes and chronic respiratory disease at 47.3 deaths per 1,000 head of population far exceeds world rates of 19.4 per 1,000, and suicide morality rates at 12.4 per 1,000 exceed both South East Asian (5.7 per 1,000) rates and world (11.4 per 1,000) rates (CSO and UNDP, 2017). The poor living standards in Myanmar contribute to the spread of vector borne diseases such as, malaria, dengue fever, yellow fever and diarrhea, cholera, influenza and tuberculosis, all of which are a major cause of morbidity and mortality. Diarrhea is common throughout the year particularly affecting children and the elderly (National Environmental Conservation Committee, 2012).

Governance of the Regions and States

Myanmar comprises seven states and seven regions as named in the 2008 Constitution and six self-

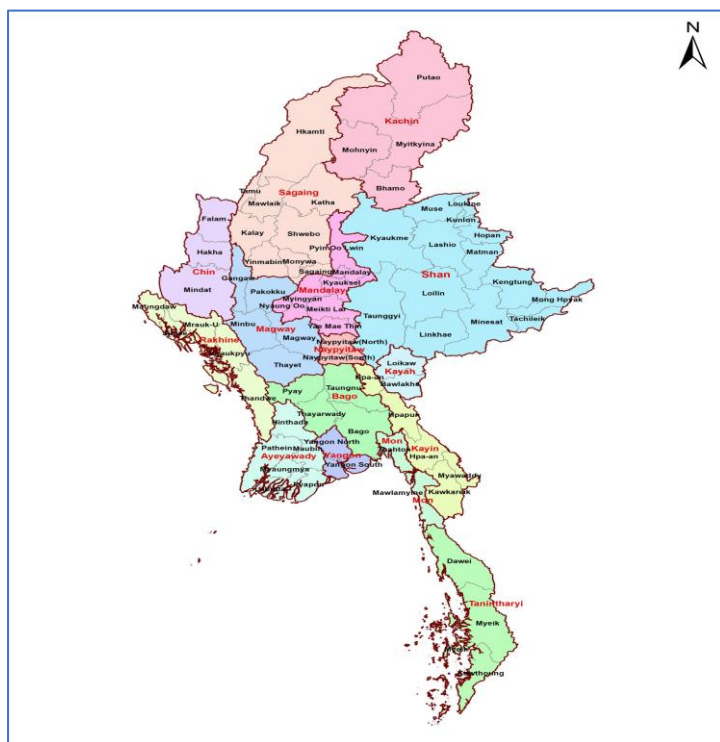


Figure 3 States and Regions of Myanmar

administered zones⁵ or divisions, one union territory containing the capital Nay Pyi Taw and 330 townships and 67 districts in Myanmar's states and regions (MIMU, 2015). The country is organized into levels of administration; village, with several villages grouped together into village tracts; urban wards; towns, with several grouped together into townships (where the lowest levels of government offices are generally located); townships are then organized into districts; several districts then comprise a region or state as illustrated in Figure 2. Regions and States are constitutionally equivalent. Under the 2008 constitution Myanmar has a multiparty democratic system, and the President appoints a Chief Minister for each State and Region.

Each State/Region has a unicameral legislative assembly (Hluttaw), but laws passed by the Union Legislative Assembly (Pyidaungsu Hluttaw) are superior to those passed at the Regional/State level (Nixon, et al., 2013). The areas in which they can pass laws are limited to the eight sectors listed in Schedule Two of the Constitution⁶. The Region /State assemblies can legislate on matters of land revenue, municipal taxes on buildings and land and the sale, lease and other matters involving property of the Region or State⁷. Revenues from the exploitation of the natural resources of a Region or State are paid to the Union Fund, and not the Region or State Fund⁸.

⁵ The six self-administered territories are Nagain, Sagaing Region, Danu, Pa-O, Palaung, Kokaung, and the Division of Wa

⁶ Constitution of Myanmar, Article. 188.

⁷ Constitution of Myanmar, Schedule Two, Articles 1, (c, e, g).

⁸ Constitution of Myanmar, Article 231

Current transitions and restrictions on effective governance

In March 2011, a new Government headed by former general U Thein Sein came to power articulating a policy framework for people-centred and sustainable development, giving “priority to improving the quality of life of ordinary citizens, and especially poor citizens and fulfilling the basic needs of the people” (Myanmar Centre for Responsible Business, 2015).

Since 2011, Myanmar has effectively been experiencing a “triple transition period”, from an authoritarian military system to democratic governance, from a centrally directed economy to a market-oriented economy and from 60 years of conflict to peace in its ethnic group, border areas. Although there is a willingness to transition, long term government reforms are hampered by the constitution and balance of power. Article 436 of the constitution states that any significant constitutional amendments can only be passed if approved by more than 75 percent of the legislators and if voters agree in a national referendum. Since active duty military personnel are mandated to hold 25 percent of the seats in parliament, the military hold the balance on legislative reform and macro budget allocations. The 2008 constitution splits the most important executive powers between the president and the commander-in-chief of the armed forces (Fink, 2015), effectively allowing the military to maintain power.

Natural resources overview and major agro-ecological regions/zones

Natural resources

The natural resources of Myanmar include oil and gas, various minerals, precious stones and gems, timber and forest products, and realised and potential hydropower. Of these, natural gas, rubies, jade, and timber logs are the most valuable and currently provide a substantial proportion of national income. Much of the country's abundant natural resources, whether soft commodities or natural gas are exported without value added processing to command higher prices, support the trade balance and generate salaried jobs that could raise peoples' incomes (Freeman, 2014). The recorded value of exports of gas, oil, coal, jade, gems, metals and wood made up about 70 percent of national exports, or about 10 percent of Gross Domestic Product (GDP) in 2012 to 2013, with natural gas exports alone recording USD 3.6 billion (Asian Development Bank, 2012). Natural gas revenues ‘represent the largest source of foreign income for the government’, with a peak of 6.5 percent of GDP projected in 2014 to 2015 (World Bank Group, 2017). Myanmar is estimated to rank 31st in the world for proven reserves of natural gas and 67th for proven reserves of crude oil (CIA World Factbook, 2018). Natural resource-related payments comprise both tax and non-tax revenue, but the exact share of Myanmar's revenue derived from natural resources is difficult to measure because royalties and fees collected by Union Line Ministries and subnational entities are not all uniformly recorded and made public.

The Natural Resource Governance Institute stated in the 2017 Resource Governance Index that Myanmar's oil and gas, various minerals, precious stones and gems are mismanaged. Myanmar scored lowest out of 58 countries included in the index across all four components studied, institutional and legal setting, reporting practices, safeguards and quality controls, and enabling environment (Bauer, et al., 2018). Despite gradual improvements in oil, gas and mining sector governance since 2013, Myanmar lacks strong management in the natural resource sector, a strong legal framework or the capacity to implement laws and regulations. Myanmar requires greater transparency and sustainable natural resource management to develop the country's natural resources

Agro-ecological regions/zones

Myanmar is 676,578 square kilometres (261,228 square miles) in size, bordered by India and Bangladesh to the west, Thailand and Laos to the east and China to the north and northeast. Myanmar lies between latitudes 9° and 29°N, and longitudes 92° and 102°E. To its south, approximately one third of Myanmar's total perimeter of 5,876 km (3,651 miles) forms an uninterrupted coastline of 1,930 km (1,200 miles) along the Bay of Bengal and the Andaman Sea. In the north, the Hengduan Mountains form the border with China, with Hkakabo Razi, located in Kachin State, at an elevation of 5,881 metres (19,295 feet), the highest point in Myanmar. Many mountain ranges, such as the Rakhine

Yoma, the Bago Yoma, the Shan Hills and the Tenasserim Hills run north-to-south from the Himalayas, and the mountain chains divide the three main river systems of Myanmar, the Irrawaddy, Salween (Thanlwin), and the Sittaung rivers. The Irrawaddy River, the longest river in Myanmar is 2,170 kilometres (1,348 miles) long and flows into the Gulf of Martaban, there are fertile plains in the valleys between the mountain chains and the majority of the population lives in these valleys with the Irrawaddy valley the most populated.

There are significant differences in settlement patterns, agricultural systems, and economic activities

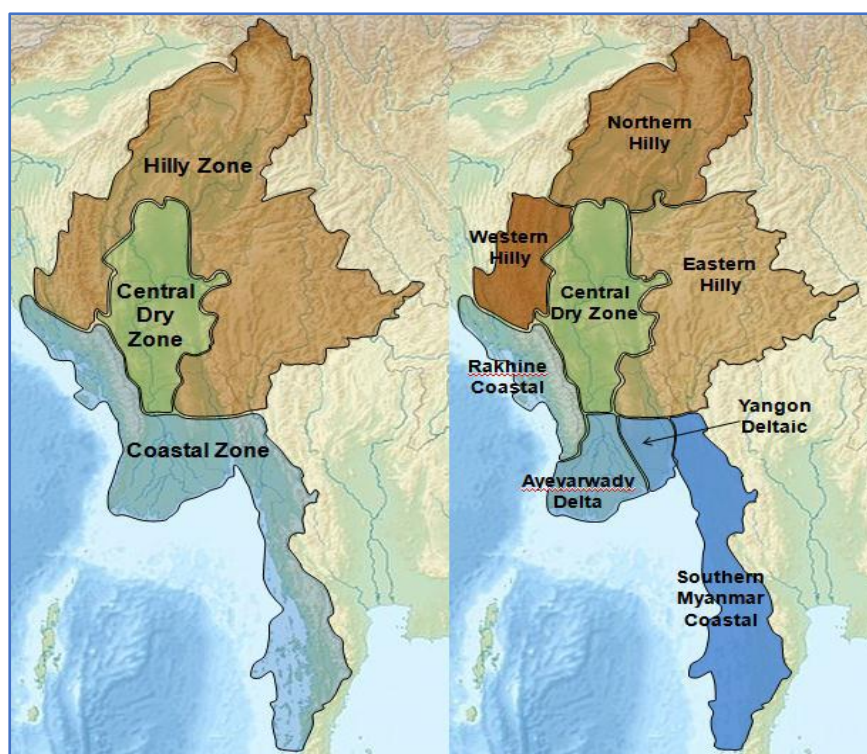


Figure 4 Agro -ecology zones of Myanmar (NECC, 2012)

due to the varying characteristics of topography, climate and ecology, geography and seasons, generate a wide diversity of climatic situations and conditions (National Environmental Conservation Committee, 2012). There are three distinct seasons in Myanmar: cold/dry season, from November to February, hot/dry season from March to April, and wet season from May to October. Annual rainfall in the coastal regions varies between 2,500 and 5000 mm, while average annual rainfall in the Dry Zone is less than 1,000 mm (Horton, et.al., 2017).

Agriculture, fisheries and livestock sector overview and main challenges

The broad span of latitude, elevation, temperature and rainfall creates agro-ecological diversity within Myanmar (Figure 4). With 12.3 million hectares of cultivated land stretching over a variety of zones (FAO, 2018), Myanmar is a major producer of agricultural commodities, with rice, pulses, maize and oilseed crops the main food crops (World Bank Group, 2016c). Agricultural production is broadly determined by the three main zones.

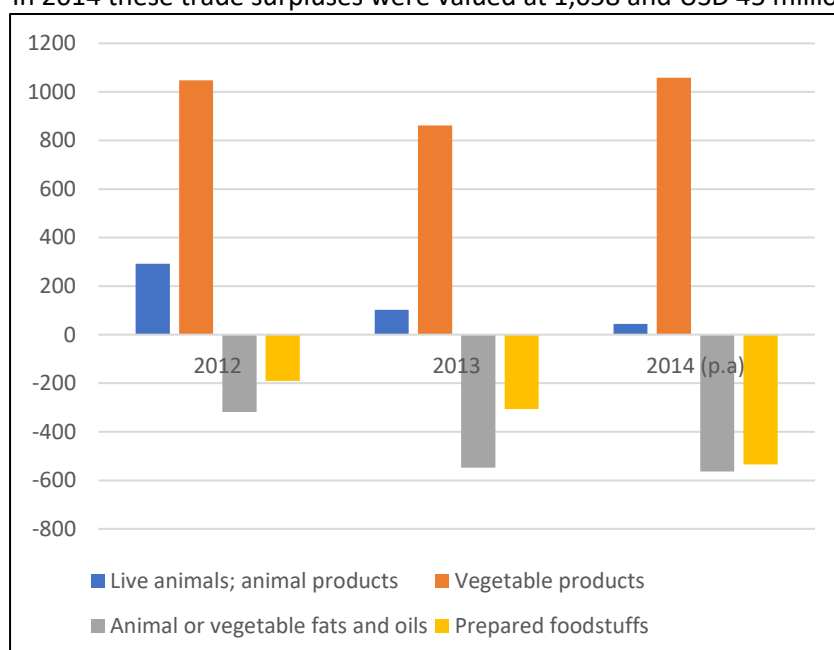
Rice production surpasses any other crop with over 12.95 million metric tons produced in 2016/17 (World Agricultural Production, 2018), the majority of rice is grown in the coastal/delta area for domestic consumption, this area receives up to 5,000 mm of rainfall per year and is well-suited for rice production. Beans and pulses are primarily grown in the arid centre of the country, often referred to as the central dry zone, where annual rainfall is approximately 600 mm – 1000 mm (Baroang, 2013). Maize is commonly grown in upland areas, often referred to as the hilly zone, groundnut is grown in both the central dry zone and hilly zone. Pulses (beans and peas) accounted for 79 percent of Myanmar's total exports in 2014 valued at USD 951 million, while rice exports totalled 12.6 percent at USD 151 million (CSO, 2018).

Most rural households raise livestock including cattle, buffalo, pigs, sheep, goats and poultry, which contributes significantly to household protein availability and supports the farm economy through draught power and by-products (hides and leather), but livestock production only accounts for around 7.5 percent of overall GDP (Ministry of Agriculture and Irrigation et al., 2015). Although commercial

production has developed near the main cities, most of the livestock production depends on family-based systems, and the shortage of livestock and increasing cost for draught power is one of the constraints on agricultural production in Myanmar.

Myanmar exports a large volume of food crops and animal products and has consistently maintained a trade surplus of both agricultural produce and animal products over recent years. Fish and prawn production far surpass all other animal products and has been climbing rapidly over recent years, reaching 5.3 million metric tons in 2014 (CSO, 2018). High levels of fish and prawn production relates directly to the extensive development of the coastline and river systems of the country.

In 2014 these trade surpluses were valued at 1,058 and USD 45 million respectively (Ibid,2018).



Myanmar remains in a trade deficit which has contributed to an overall balance of payments deficit in 2015 to 2016 (-0.7 percent of GDP) and low foreign exchange reserves (2.5 months of imports at end March 2016). Falling exports were due to gas and agricultural commodities (60 percent of export basket), which led to the current account deficit widening from 3.3 percent of GDP in 2014 to 2015 to 4.8 percent in 2015 to 2016 (World Bank Group, 2016a).

Table 2 Balance of Food Trade (USD) (World Bank Group, 2016a)

Vulnerability

Multi sectorial

Myanmar ranks second on the climate risk index of the most affected countries from long term climate risks with 41 events and the highest death toll, it has also remained in the top three countries most affected by climate change events continuously over the previous two decades (Kreft, Ecktein and Melchor, 2016). The wealth, economy, and society of Myanmar are defined by and highly dependent on the environment, natural resources, climatic conditions and the health of the eco-system. Due to the geographic location and geo-morphology of the country, Myanmar is regularly exposed to a series of natural events with potentially severe negative impacts.

Climate change including increases in temperature, changes in total rainfall and rainfall patterns including a decrease in the duration of the monsoon season and an increase in the recurrence and severity of extreme weather events all increase the vulnerability of Myanmar and its residents. Current impacts of climate events include strains on water resources, especially in the dry zone, public health risks due to water-related diseases and heat stress-related disorders. In addition to forestry depletion due to destruction by tropical cyclones, strong winds, and floods in addition to human pressure. And coastal systems facing rising sea surface temperatures leading to increased cyclone intensity, the associated strong winds, high storm surges, destruction of fish habitat and decreased fisheries production.

High poverty levels, inadequate, inappropriate and disproportionate development, increasing climatic risks, geographic instability and five decades of inadequate funding and support for core social sectors



such as health, electricity distribution and road networks all contribute to the vulnerability and risk for the Myanmar population and pose complex challenges for leaders and administrators to resolve.

Inadequate development including a lack of agricultural inputs, irrigation, rural roads, access to finance and limited technology undermines and increases vulnerability. Currently, 9.2 million people are estimated to be living in villages that are not connected by any road which translates to 40 percent of villages and 25 percent of the rural population without access to an all-season road (Ministry of Agriculture and Irrigation, et al., 2015). In any disaster situation the ability to reach affected communities with aid and supplies is limited.

With limited access to markets and little access to health care (including reproductive and maternal health services), education services and alternative employment opportunities, vulnerability increases and preventative action is limited. In this context, not only is climate change a vulnerability in Myanmar, but climate change is also a multiplier of other pre-existing vulnerabilities, which leads to higher overall impact, and a longer recovery period.

Further, poor access to financial services fosters a context of perpetual hardship and vulnerability, as it impairs the ability to invest in disaster risk reduction measures, manage unexpected events and fund recovery efforts. In rural areas, a significant proportion of the population has no access to formal financial services and insurance and hence rely on informal loans with high interest rates and no regulatory environment, further adding to the cycle of poverty prevalent in rural Myanmar. An ActionAid study on small and medium fisher-folks found the lack of available insurance compounded the sectors vulnerability to climate change and disaster (Chawzang and Myar, 2011).

The Government of Myanmar has identified the compounding factors of climate change to be:

- Employment and the national income is dependent on climate-sensitive sectors such as agriculture, forestry and natural resources
- Human populations and economic activities are concentrated in the coastal zone, low-lying lands that are exposed to long-term climatic impacts such as sea-level rise and an increase in cyclones, storm surge and flooding
- Exposure to both geological and meteorological hazards (e.g. earthquakes, floods, cyclones and tsunamis) as a result of the southwest location of the country within the Bay of Bengal and the long and low-lying coastal zone which stretches across the Arabian and Indo-Chinese Tectonic Plates
- High poverty levels which affect capacity to prepare adequately for and respond to climate change related impacts 
- Limited technological capacity to prepare for the impacts of climate change or the consequences of climate change related events (MSWRR (NDMC), 2017). 

Poverty

Poverty and low socio-economic status dominates the rural areas of Myanmar and is the main influence on vulnerability over all aspects of life. With human vulnerability most often rooted in poverty and social marginalisation, and age, gender, and level of education the other factors significantly influencing the degree of vulnerability of the exposed population. People living in agriculturally dependant rural areas of Myanmar are extremely vulnerable to the effects of climate change and disasters. Small-scale farmers in Myanmar endure daily labour-intensive farming techniques and have limited access to credit, as crop diversification is rare and often unavailable, farmers are exposed to higher levels of crop failure due to floods, landslides and drought, crop disease and due to armed conflict. Also, not being engaged in stable paid employment, those in rural areas lack the means to build up a “cushion” to withstand shocks, such as disasters and crop failures (MSWRR, 2017). A lack of social mobility, and no formal social protection leaves those in poverty

vulnerable and unlikely to move from this position. The combination of natural hazards, pre-existing vulnerabilities, poverty, inappropriate development, and climate change increase disaster risk in Myanmar as illustrated in Figure 5 above (MSWRR, 2017).

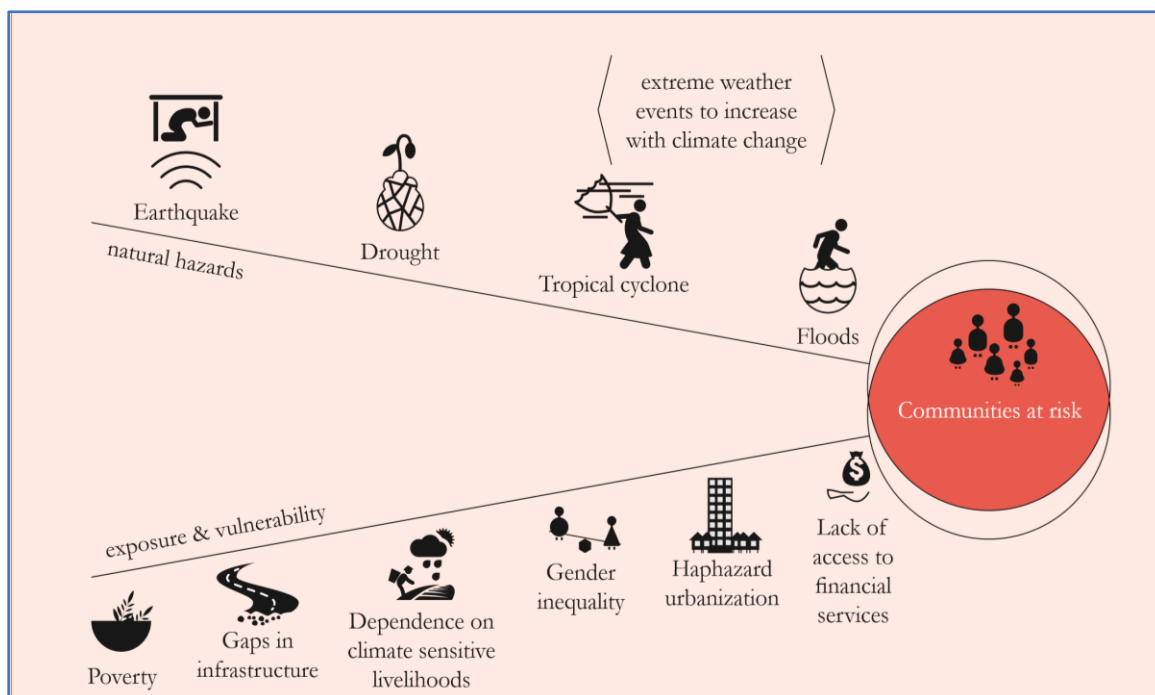


Figure 5 Natural hazards and development related factors (MSWRR, 2017)

The ethnic diversity of 135 distinct ethnic groups and many linguistic variations also contributes to vulnerability. Myanmar remains engrossed in rampant ethnic strife with complex civil war long dominating the modern history of the country (Relief and Resettlement Department, 2015). Those marginalised through conflict and non-acceptance are further exposed to compounding vulnerability, in addition to the ever-constant threat of agricultural producers that their crops will be seized by an armed group, particularly when the crop has just been harvested and is ready for sale.

Gender

The vulnerability of women to natural hazards is compounded by a range of factors⁹, including:

- Despite their contribution to agriculture, women are often viewed as labourers rather than farmers and paid less than men for the same work (Akter, et al., 2017). With less income, women are less able to build up sustainable livelihoods, savings, and assets to build resilience
- Women have less opportunity to own land, resulting in a precarious position of dependency with limited income and corresponding capacity to invest in risk reduction measures (Srinivas and Hlaing, 2015)
- Women have limited access to credit and understanding of accounting and records¹⁰, which restricts the availability of options to sustain livelihoods despite shocks and day-to-day stresses

⁹ Derived from MSWRR publication Myanmar National Framework for Community Disaster Resilience, 2017.

¹⁰ Women's Self-Help Group testimonies that women are reluctant to participate in community groups due to lack of understanding of accounting and records but once gaining confidence are able to cooperate and depend on each other to manage finance, even argue on what they think is right (ActionAid Myanmar, 2017b).

- Women are likely to spend much more time than men on family related care work, limiting their productive time and mobility, which impinges upon income with implications for resilience (Hall and Myanmar Survey Research, 2017)
- Most households headed by poor women do not own a phone and many women do not know how to use phones as these are owned by their husbands (Scott, 2017). This lack of easily available access to information undermines decision making on a day-to-day basis and renders women less connected with early warning systems
- Women-headed households tend to have less sturdy houses because they are likely to be poorer (UNICEF, 2015). This increases the likelihood of damage such as in a flood or cyclone
- Women are less aware of their rights and have less representation in leadership and decision making (Asian Development Bank et al., 2016)
- The female perspective on what it takes to be resilient is underrepresented (MSWRR, 2017)
- The 2015 Agriculture and Livelihood Flood Impact Assessment Report (Ministry of Agriculture and Irrigation et al.) found female headed households suffered significantly from the impact of the 2015 -2016 floods on their livelihoods with large losses of small livestock and fishing equipment, deprivation of income by lack of casual labour demands and limited access to land and productive assets for recovery. A 2011 ActionAid study found the impacts of Cyclone Nargis and Cyclone Giri put pressure on women to take up multiple roles and the demand for women's productive role has increased in Myanmar coastal fishing communities (Oo, 2011).
- Twice as many women as men reported reduced food intake and wages for women dropped by at least 20 percent as a direct impact of the lack of job opportunities (Ministry of Agriculture and Irrigation, et al., 2015).

Sectoral vulnerability

Nexus overview

Myanmar is increasingly exposed to severe hydro-metrological events, including cyclones, floods and heavy rains, and slow onset disasters including droughts, in addition extreme temperatures are becoming more frequent and the consequences more severe (Myanmar Climate Change Alliance (MCCA), 2018). The predictability of the rainy periods has diminished which historically has determined agricultural, economic and cultural traditions related to the monsoon season, consequently agricultural seasons and practices, and social systems are attempting to adapt. If the projections are confirmed (PRECIS modelling), there will be further significant rises in temperature, more clear sky days and higher temperatures in the dry season exacerbating drought periods, changes in the rainfall patterns and intensity, increases in risk of floods resulting from a late onset and early withdrawal of monsoon events (with no associated reduction in the overall rainfall), and increases in the number and intensity of cyclones, strong winds, floods, storm surges, intense rains events (Horton, et al., 2017).

Extreme high temperatures, and sea-level rise will also continue and increase. With the rise in sea-levels threats to the coastal areas of increased salinization, increased snow-melt in the mountains, increased soil erosion and degradation, increased negative effects on bio-diversity and disruption of eco-systems, all aspects of Myanmar society will be impacted and Myanmar will continue to become increasingly vulnerable. Table 3 provides an overview of the impact zone of different extreme climate events, Annex A provides a history of the most significant natural disasters in Myanmar this century and the accompanying vulnerability consequences (both derived from MSWRR, 2017).

| Extreme weather event | Vulnerable areas and Regions/States |
|--------------------------|---|
| Drought | Central Dry Zone, Sagaing, Mandalay and Magway Regions particularly agricultural land occurring in these areas. |
| Cyclone/strong winds | Coastal regions, Rakhine, Ayeyarwady and Yangon Regions/States. |
| Intense rain | Tanintharyi, Yangon, Rakhine, Ayeyarwady and Mon State/Region. These areas have the longest exposure to the south west monsoon flow. Lower Myanmar as well as north-western areas will also be affected. |
| Flood/storm surge | All low-land and flat Regions as well as rivers and associated valleys and basins. Areas in close proximity to the Ayeyarwady, Chindwin, Sittaung and Thanlwin river systems and coastal areas are particularly at risk to storm surges, hydrological floods, flash floods and river bank overflow associated with snow-melt. |
| Extreme high temperature | Relatively flat regions in the Central Dry Zone, Mandalay and Magway. |
| Sea-level rise | Coastal zones, especially areas interspersed with tidal waterways, the Ayeyarwady Delta. In certain areas low-lying coastal areas may face permanent inundation. |

Table 3 Impact zones for extreme climate events (MSWRR, 2017)

Agriculture

Impacts on productivity of current agricultural techniques and crops, sudden destruction of cultivations by severe hydro-metrological events or lack of production because of droughts, long term soil erosion through the rise in temperature in Myanmar are expected to increase in extent, duration and severity. This is expected to have negative impacts on overall agricultural production for domestic consumption and export and on internal food security, particularly for the those living in poverty and the most vulnerable members of society. These affects are already taking place, agriculture growth decelerated by 2 percent in 2015-2016 compared to 5.6 percent the previous year due to the impact of heavy rains between July and September 2015 causing widespread flooding and landslides (World Bank, 2016a). The sector contributed less than 10 percent of overall growth to the economy although the floods were geographically widespread, major agricultural producing areas were particularly most severely hit. In addition to crops in the fields, the disaster affected storage facilities with products for export and domestic sale and stocks of seed for the next season. Losses were generated from lower crop production, and reduced output of meat and eggs. These in turn had knock on effects beyond agriculture in food processing, trading, and transportation services. Over 80 percent of the value-added losses estimated over 0.8 percentage points of GDP, come from the agriculture sector (Raitzer, Wong and Samson, 2015).

Fisheries

Fisheries are impacted by climate change affecting the coastal and marine environment, causing deterioration of mangroves, coral reefs and sea-grass beds, which are vital breeding and feeding grounds for fish. Severe cyclones cause loss of fishing vessels and impact offshore, inshore and inland fisheries, causing high economic losses (National Environmental Conservation Committee (NECC), 2012). Hydro-metrological events also cause losses and structural damage of aquaculture facilities, fishery farming and breeding ponds and fishing equipment. All of this infrastructure was severely damaged and production plummeted following the cyclone of 2008, and there was significant contraction in fishery production caused by the floods in 2015-2016 (Asian Development Bank, 2016a) Severe hydro-metrological events and rising sea levels are both contributing to salt water intrusion further up-stream in the delta areas, causing loss of habitat and overall catch of freshwater species of fish, in addition to rising salinity in the groundwater. The rising salinity causes crop failures and makes ground water sources of water unusable for drinking for either humans or farm animals (MCCA, 2018).

Livestock

Livestock are severely impacted through climate induced hydro-metrological events and disasters, cyclones cause losses in livestock populations, while extreme high temperature spikes lead to mass deaths of small livestock and also lead to pests and disease outbreaks such as foot and mouth disease (NECC, 2012). Drought leads to lower fodder production and less water for drinking and cooling (Drury and Aqua Rock Konsultants, 2017). A combination of all the above had a negative effect on household incomes in 2008 and 2015-2016. The resulting economic impact is measured by the damage to physical assets and loss in production flows. The financial impact upon the sectors is provided in Table 4 (MSWRR, 2017).

| Development sectors | Cyclone Nargis 2008 | Floods and landslides 2015 |
|---|---------------------|----------------------------|
| Agriculture, Livestock and Fisheries | 571,000 - 694,000 | 713,217 |
| Industry and Commerce | 2516,600 | 480,808 |
| Housing | 711,900 | 542,233 |
| Education | 116,300 | 50,772 |
| Health | 18,900 | 8,185 |
| Loss as a percentage of GDP of the previous fiscal year | 21 | 3.1 |

Table 4 Impact of disaster on key development sectors (MSWRR, 2017)

Human contribution to the severity of recent climate change and disaster events

In recent decades, farmers in the low-lying Ayeyarwady Delta region have cleared vast tracts of coastal mangrove forests to expand rice cultivation and increase export-oriented prawn farming. The tidal surge caused by Cyclone Nargis in 2008 exacerbated the cyclone's toll. Mangrove forests could have cushioned the impact of the sea surge and potentially reduced the number of drownings from the 3.5m storm surge that swept nearly 40km inland. Although mangroves and forests cannot prevent inundation and inland flooding associated with storm surge, the impacts of waves and currents associated with the storm surge could have been mitigated (Centre for Excellence in Disaster Management and Humanitarian Assistance, 2017). Coastal forests can also act as windbreaks in reducing devastation in coastal communities resulting from cyclones.

The forests of Myanmar have been affected by degradation, shifting cultivation, and conversion to commercial oil palm plantations (the latter is particularly relevant in the lowland forests of the Tanintharyi Region) (Baskett, 2016). Deforestation pressures include, fuelwood consumption, which is still the principle source of energy for the population of Myanmar, unplanned and unrestricted agricultural expansion, aquaculture, infrastructure development and commercial clear cutting.

Some of the drivers of deforestation include agriculture, both for nourishment and industrial needs, legal and illegal logging, and various types of mining. Over the period 2000 to 2005, the annual deforestation rate in Myanmar has been estimated at 466,400 hectares per annum and in the period 1990 to 2005, Myanmar has lost 17.8 percent of its forest cover (Wang and Myint, 2016). Deforestation, varies considerably among the regions, the densest forests are found in Shan, Kachin, and Sagaing, in the northern parts of the country. The central and more populated States and Regions show the highest losses of forest resources predominately the mangrove forests in the Ayeyarwady delta and the remaining dry forests at the northern edge of the central dry zone (JICA and Sanyu Consultants Inc, 2013).

Challenges

Poverty reduction, disaster risk reduction and climate change adaptation challenges

The greatest challenge for Myanmar to reduce the risk of disasters, adapt to climate change and reduce poverty is the competing priorities of moving the country forward into the 21st century across a great number of sectors simultaneously, including changing the governance structure, finance regulation, taxation, health, education and infrastructure development. Myanmar is attempting to simultaneously move from a development country status by achieving the Sustainable Development Goals, in addition to meeting the United Nations Framework Conventions on Climate Change, ensuring disaster mitigation and preparedness and achieving the national building goals as set in Myanmar's Intended Nationally Determined Contribution (Ministry of Environment, Conservation and Forestry (MoECF), 2015). Green growth which takes climate change into consideration, requires developing climate resilient, low emission procedures and infrastructure and implementing energy efficient, renewable energy sources, projects and products, supported by sustainable transport systems and integrated urban planning. This is a significant challenge for the government in a country still dealing with several internal conflicts, high levels of poverty and inadequate infrastructure often decades out of date.

A clear indication of the conflicting priorities of the government is the example of achieving Sustainable Development Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for 80 percent of the population by 2030 (from 31 percent in 2015-16) (CSO and UNDP, 2017). However, meeting this goal with limited greenhouse emissions through the use of clean energy generation requires higher costs over large geographic difficult areas and significant infrastructure planning and development, at a time when the government has a very immature taxation system, and therefore collects a very low amount of tax, from, nationals, non-nationals and businesses (MoECF 2015). The underdeveloped taxation and revenue collection and distribution systems is further complicated by competing priorities between government departments for any available government funds¹¹. As the impact of climate change and natural disasters are clearly evident, the greatest challenges facing the country's leadership and policy makers is to achieve sustainable development, address financial constraints, and technology and capacity gaps, whilst improving social standards, through job creation, education reform and health sector improvement.

Whilst the new democratic government has been widely rejoiced, the parliamentary system remains highly unfavourable to introducing and implementing change, the former military government have a mandated 56 seats (of 224) in the upper house and 110 (of 440) in the lower house of government with five-year terms (Egreteau, 2017). The introduction of new legislation, amendments and changes is complex and rarely efficient, and the resignation of President Htin Kyaw, the head of state and the head of the government on 21 March 2018, is predicted to further increase the inertia of the parliament. Ranking 130 in a scale of 180 of corruption (Transparency International. 2018) reflects the widely held perception of corruption at all levels of government and administration in Myanmar. The need to pay bribes, provide kickbacks, pay 'tea money', allow illegal activity, especially in the mining and extractive sectors and not complain continues to challenge meaningful development (Myanmar Centre for Responsible Business, 2017).

Specific to the nexus of climate change adaption, disaster risk reduction and poverty reduction is the overriding need for land tenure reform. The lack of land tenure security is critical with the majority of the population relying on agriculture related activities for their livelihoods. Access to land and being able to develop land, has been constrained due to past confiscations and land expropriation by the previous military government, hence many of the rural population work the land but are effectively landless (UNOCHA, 2016). It is further complicated by indeterminate entitlements to land; lack of a

¹¹ Although precise figures are not available, Myanmar's tax revenue is estimated at 9 trillion kyat (USD 6,750 million), the tax revenue of South Korea with a similar population size is equivalent to USD 406,156 million. Myanmar Times, 2018a. *Tax revenue increased by K203b for second half of fiscal year 2016-17*. Myanmar Times and OCED Stat, 2018.

comprehensive land registry and related geospatial information; lack of formal methods to protect and recognize customary rights to land; lack of processes allowing Free, Prior and Informed Consent (FPIC); excessive application of the state's power of eminent domain; and a policy for the allocation of land concessions that ignores or overrides the customary rights and interests of other rights holders (Ministry of Agriculture, Livestock and Irrigation, 2016).

In Myanmar lack of land ownership, is compounded by the lack of security. Ethnic conflict and the associated threat of both land and crop seizure, are disincentives to farmers to invest in the land and work hard to produce high value, high yield crops. Lack of land and crop security are also disincentives for at-risk communities to invest time, effort and funds in initiating, developing and maintaining disaster resilience measures, and climate change adaptations.

Financing, appropriate affordable credit, insurance, and fund transfer services is highly restricted, the vulnerable population, women, youth, day labourers and the landless continue to face constraints in accessing affordable, regulated credit, thereby further increasing their vulnerability to disasters. Therefore, a significant proportion of the rural population relies on informal unregulated loans at exorbitant interest rates, which further adds to their vulnerability through indebtedness and deepening financial insecurity to service burdensome payments (Ministry of Agriculture, Livestock and Irrigation, 2016).

Insurance in any form is difficult to obtain and although recently Myanmar opened up to international financing, insurance is still predominately through the government owned insurance firm and is not feasible for most of the population. At present, land administration in Myanmar is characterized by multiple and overlapping institutional mandates, laws and regulatory frameworks, and weak land classification, which prevents using land as a security to gain finance or to insure developments on the land, such as dwellings and other farm buildings.

Post program evaluations and case studies from the field continue to advise of the significant lack of environmental awareness regarding how people use natural resources, especially in the rural areas. The education levels of Myanmar once extremely high, have continued to fall in recent decades, and although literacy levels are rated at 93 percent (Department of Population, 2015), the quality of the education is low, and many of those in rural and ethnically diverse areas lack even the most basic education and do not speak or read Burmese, the national language. **Communicating climate change management, disaster mitigation and improved agricultural practices remains a significant challenge for the government and support organisations in this environment.**

Schooling is divided between monastic, government and private schooling and although efforts are underway to standardise education standards, including education in Disaster Risk Reduction (MSWRR and Ministry of Education, 2014), instilling meaningful knowledge and the ability to critically analyse information remains a challenge.

Communication access is currently variable, 49.5 percent of households have access to television, 35.5 percent have access to a radio, 32.9 percent use a mobile phone (63.5 percent in rural areas) with only 10 percent have landline and internet access at home (Department of Population, 2017a). The Government has identified the limited technology for remotely and automatically forecasting extreme weather events reduces the time for communities to prepare for events as a constraint. In the case of Cyclone Nargis it was found even when information did reach communities there was little knowledge of what to do, what the information meant or how to interpret the magnitude of the threat. Whilst this situation is currently a challenge, it should evolve into an opportunity as mobile phone usage, and the knowledge and capacity to use mobile phone weather, disaster warning, agricultural and farming information apps increases.

The rate of urbanization in Myanmar has increased over the past decades from 24.8 percent of the total population in 1983 to 29.6 percent in 2014. Yangon, with an urban population of 5.2 million, is the most urbanized region and accounts for about 35 percent of the total urban population. It is

projected that by 2040, Yangon will become a megacity with a population of 10 million (Department of Population, 2016). Internal migration without sufficient planning increases the impact of social conflict, environmental degradation and reduced family support systems in times of disaster and hardship.

Without urban planning development (the mapping and planning required for a modern megacity), not only will the current unregulated buildings and development cause havoc if there is a major hydro-metrological event in the future, the environmental degradation and lack of waste management will expose Myanmar to potential devastation. Although new building legislation has been endorsed, the education and engagement of developers and builders, and regulation implementation is required (Myanmar National Building Code, 2016).

Private enterprise within Myanmar and foreign investors have been reluctant to engage and seek regulation for social and environmental impacts in all areas of development but especially in mining and hydro-power enterprises (UNDP and UNEP, 2016). Although quasi regulations exist in some sectors, the need to attract and harness investment and industry by government currently far outweighs regulation compliance and corporate social responsibility, hence self-regulated industries continue to operate with minimal overheads, regulations and taxes.

The challenge of raising the status of women in Myanmar society is impacted by the climate change, disaster, poverty nexus. As research improves with the opening of Myanmar to the INGO community, the details on the treatment of women is being clarified. Women are more vulnerable to abuse, violence and exploitation as overall vulnerability of communities is exacerbated by the effects of with climate change, disasters and poverty (MSWRR, 2017).

Twice as many women as men perished in the Ayeyarwaddy Delta during Cyclone Nargis often due to lacking the strength to hold onto trees or in trying to save children and others (Cumberland, 2008), and if they do survive, women in IDP camps bear the brunt of displacement, and are burdened overwhelmingly with the responsibility for children, the elderly and those with disabilities. The situation for displaced women is dire with a Rapid Situation Monitoring (RSM)¹² finding women were most likely to rely on direct food aid for all food and nutrition security. Women are also more likely to suffer violence and abuse due to lack of privacy, lack of security, lack of sanitation, lack of housing and lack of electricity for lighting (Government of the Union of Myanmar, 2015).

Opportunities

Poverty reduction, disaster risk reduction and climate change adaptation opportunities

Emerging from an inwardly focused past, Myanmar has commenced the process of reform and rebuilding and expanding the knowledge, skills and educational standards of the population. It is well established that the education of children and young adults provides the opportunity to influence adult knowledge and subsequently household and community behaviour especially regarding emerging technology, environmental education and conservation interventions (Damerall, et al., 2013). As schooling systems in Myanmar reach all geographic areas and ethnic communities, the ability to reach and provide knowledge to adults through the children is the most extensive and expansive mechanism available.

As the Ministry of Education develops and standardises the curriculum across all levels and types of education facilities the inclusion of education on climate change, education on **alternative employment** and the associated poverty alleviation practices and food security are the single greatest opportunity and should be viewed as essential. The Ministry of Education and the Ministry of Social Welfare, Relief and Resettlement (2014) have already commenced the process of education on the Guidance of Mainstreaming Disaster Risk Reduction in the Education Sector and is working with

¹²Rapid Situation Monitoring (RSM) conducted in September 2016 by WFP A total of 85 households were surveyed in the RSM exercise (WFP, 2016).

UNICEF, UNESCO, the Myanmar Red Cross Society and many other INGOs and CSOs. This provides a blueprint for all sectors to support the Ministry in achieving educational improvements and integrating the nexus of informed judgement, critical thinking and decisive action to the emerging generation.

The Department of Education operates the state schooling system, but a large proportion of students from the very poorest homes and communities attend Monastic schools which are not yet bound by the Union level curriculum. The Monastic education system itself is undergoing transformation, is moving from religion orientated instruction to mainstream education and is seeking to establish standards and improve quality, leading to organisational bodies such as the Monastic Education Group. As the Monastic education system moves towards adopting the Union curriculum it is seeking support and assistance, and an opportunity exists to introduce climate change, disaster awareness and poverty alleviation education into the monastic system. Recent successes in child awareness, child centred instruction and child protection in the Monastic schools and the knock-on effect to the parents and carers provide clear evidence of the opportunities to engage at all levels (Tin and Stenning, 2015).

An opportunity also exists to introduce climate change, disaster awareness and poverty alleviation strategies into mainstream agricultural education, due to the concentration of tertiary level agriculture education being at a single institution, the Yenzin Agricultural University. A concentrated and consistent curriculum component to educate future decision makers, business leaders and agricultural advisers, should be considered an opportunity.

The growth of mobile phones and associated social media has been exponential in very recent years. The 2014 census recorded that 63.5 percent of residents had mobile phone access in rural areas, this increased to 80 percent in late 2015, and is estimated to be well over 90 percent currently (Government of the Union of Myanmar, 2015). Women with access to a mobile phone is also increasing with 57 percent of women advising they intended to buy a new phone within the next year (ibid, 2015).

Although mobile phone communication is rapidly improving a 2015 BBC survey found 49 percent of respondents did not know how to deal with climate change, weather events and possible disasters (Colquhoun, et al., 2016). Opportunities exist for the development of Apps such as the UNDP supported iWomen app, which has connected over 22,000 rural women and supported savings and lending groups (UNDP, 2018a).

Agri-mobile apps such as those hosted by <http://www.en.greenwaymyanmar.org/> provide same time updates to rural producers including information to improve agricultural outputs and income levels and technical assistance on planting and seasonal calendars with consideration to climate change impacts. Hazard reduction and First Aid apps from the International Red Cross Global Disaster Preparedness Centre (<https://www.preparecenter.org/activities/universal-app-program/>) are gaining increasing engagement of users. The development of knowledge management that is easy to use, translated and inexpensive and reaches mass populations remains in the early stages and within Myanmar is subject to the highly interpretive *Telecommunications Law 2013* and *Broadcast Law 2015*, but presents an expansive opportunity platform for the future.

In supporting the Government in Myanmar in achieving the SDGs whilst maintaining the integrity of people and culture, the Government has recognised the importance of the international donor and INGO community and recently released the Myanmar Development Assistance Policy (Development Assistance Coordination Unit, 2018). Fundamental to the policy is ensuring development assistance aligns with Myanmar's national planning and budgeting framework. In partnership with development partners, the Government seeks to prevent duplication, fragmentation and ensure standards are maintained. Although some development partners will view the policy as constraining, opportunities to engage in meaningful and achievable dialogue and development with the support of the government is now clearly outlined and regulated.

The Government acknowledges the role of the international community in providing expertise and assistance especially in the development of disaster risk analysis, disaster risk mitigation, technological assistance and mapping for disaster and climate change monitoring especially at the state, township and village level. The lack of resources of the Government to reach the population and accelerated time frames for the Myanmar Action Plan on Disaster Risk Reduction provide a range of opportunities for engagement and program implementation (Relief and Resettlement Department, 2015).

Land tenure and land reform remains a core requirement for the three nexus points of the current study. Similar to many Asian neighbours, land reform although necessary is a complex and a long-term challenge. Securing land tenure requires not just legislative reforms but community support, public confidence and agreement on how to administer land and resources. Judicial reform, dispute resolution and administrative support and knowledge are also required. Building on the FAO guidelines of land tenure projects and the USAID conceptual frameworks (FAO, 2002), an opportunity exists to assist government, grassroots community organisations and individual rural producers to implement meaningful, appropriate and fair land reform policies. Assistance in community resource documentation and participatory mapping allows village boundaries and land use maps to be developed for villages (USAID, 2018), which is essential in the land registration process. An opportunity exists to provide technology and training such as GIS mapping to community representatives, real time mapping and details expedite process and provide images for future land practice management and climate change assessments at the macro level.

There are a wide range of opportunities supporting and encouraging the engagement of the private sector and instilling corporate social responsibility, climate sensitive, disaster mitigation and poverty alleviation due to the Government introduction of the *Myanmar Companies Act 2017* and *Myanmar National Building Code 2016*, with the associated guidelines for urban and rural planning.

Since 2012, the expansion and development of a social protection system to ensure universal health coverage and education equity, has seen a range of partnerships between government and non-government actors which prioritise the poor and vulnerable. Although the prioritising and identification of the poor and most vulnerable, geographical and administrative constraints and low fixed government budgets will remain ongoing challenges (Dutta and Okamura, 2015). There are a range of opportunities for social protection programs to improve resilience to natural disasters and build productive assets in local communities that enables households to invest in health and education, access better jobs and make productive investments (Dutta, 2015).

Overviews

The twelve-point economic policy prioritized the rapid development of fundamental economic infrastructure such as electricity generation, roads, ports, building environmentally sustainable cities, upgrading public services and utilities, expanding public spaces, and making greater efforts to protect and conserve the cultural heritage of Myanmar. The Economic Policy (2012) for the Republic of the Union of Myanmar states:

'The economic policy of the Union of Myanmar is people centred and aims to achieve inclusive and continuous development. It aims to establish an economic framework that supports national reconciliation, based on the just balancing of sustainable natural resource mobilization and allocation across the States and Regions.'

Poverty reduction and rural development

In 2012 the Union commenced the development of the Myanmar Comprehensive Development Vision, the Framework for Economic and Social Reforms (FESR) through the Ministry of National Planning and Economic Development and the 20-year National Comprehensive Development Plan 2011–2031. The four 5-year implementation plans, of which the FESR is the first, provide the roadmap to development of the critical triangle of growth, poverty alleviation and sustainability to achieve rural development.


The Ministry of Social Welfare, Relief and Resettlement oversees the 2014 Social Protection Strategic Plan encompassing policies, legal instruments and programmes for individuals and households that prevent and alleviate economic and social vulnerabilities. Promote access to essential services, infrastructure and economic opportunity, and facilitate the ability to better manage and cope with shocks that arise from humanitarian emergencies the associated sudden loss of income and complementary support to the health and education sectors. The National Comprehensive Development Plan lays down targets and objectives for the agriculture sector requiring the ministries of agriculture and irrigation, livestock and fisheries, and environment conservation and forestry to find cooperation and synergies between their respective ministries and departments.

Poverty reduction and inclusive growth drive macro-economic policies and provide focus to sectors and relevant Ministries in the formulation of policies, plans and frameworks. Already a signatory to the Millennium Development Goals which came to the end in December 2015, the Union remain committed to the 230 indicators of the Sustainable Development Goals. Not only are Ministries responsible for goal achievement but the 15-year time limit to 2030 provides urgency and emphasis for essential management to balance the three dimensions of sustainable development, economic reform and expansion, and sustainable social and environmental development.

The National Strategic Plan for the Advancement of Women 2013-2022 provides a comprehensive ten-year National Strategic Plan which targets the key areas in the lives of women and provides practical ways to address the issues that Myanmar women are experiencing. This plan is based on the 12 Priority Areas of the Beijing Platform for Action and the principles of the Convention on the Elimination of All Forms of Discrimination against Women, to which Myanmar became a signatory in 1997. A number of legislative reforms have supported vulnerability and marginalized persons including women such as the *Law on the Practice of Monogamy 2015*, the *Law on the Rights of Persons with Disabilities 2015* and the *Early Childhood Development Law 2014*, but policy and procedures for implementation, monitoring and evaluation remain lacking.

Education and health care reform have significant challenges, given the very low base and poor resource and funding allocation for five decades they encountered under the previous leadership. Educational reforms focus on curriculum development and Child Centred learning conversions to accepted world standards. The 2014 Health in Myanmar developed 12 task force entities, empowered to focus on health recovery and tasked to achieve universal health coverage in Myanmar by 2030.

Disaster risk reduction and management

The Republic of the Union of Myanmar identifies  vulnerabilities of poverty and inequity, climate change and variability, urbanisation, limited technology, unsustainable use of natural resources, declining ecosystems, lack of regulations in the private sector and health risk exposure as all contributing to increase the exposure of the population and their assets to hazardous situations and potential disasters.

After Cyclone Nargis in 2008, the Government of Myanmar overhauled its reactive approach to disaster management and started to focus its efforts on reducing vulnerabilities and risk, initially establishing the Disaster Risk Reduction Working Group and associated sub-national working groups. The Government drafted and implemented the 2012 Myanmar Action Plan on Disaster Risk Reduction (MAPDRR). Following on with the *Disaster Management Law 2013* and Rules (2015) and in 2015 the National Disaster Management Committee was enacted to set up the disaster risk management legislative and institutional framework.

The current 2017 Myanmar Action Plan on Disaster Risk Reduction (MAPDRR) guides all stakeholders' contribution to improving the safety and resilience of the country against disasters. The MAPDRR Steering Committee and National Disaster Management Committee require the engagement of the highest levels of government, Permanent Secretaries, Director Generals, Chiefs of Staff, Union Ministers and Chief Ministers, ensuring commitment and responsibility throughout the country's leadership.

The MAPDRR is aligned with the Hyogo Framework for Action and the ASEAN Agreement on Disaster Management and Emergency Response and demonstrate the commitment of the government to global and regional frameworks, plans and agreements related to disaster risk reduction and management, climate and responsible development. Compliance with the Sustainable Development Goals, Sendai Framework for Disaster Risk Reduction, the Paris Agreement on Climate Change and the Asia Regional Plan for Implementation of the Sendai Framework for Disaster Risk are included in the MAPDRR. **The MAPDRR has set disaster targets and indicators of global and regional levels to ensure compatibility in the monitoring and reporting process.** The targets for 2030 aim to measure changes in disaster impact.

| Targets | |
|---------|---|
| 1 | Substantially reduce disaster mortality in Myanmar by 2030 |
| 2 | Substantially reduce the number of people directly affected by disasters in Myanmar by 2030 |
| 3 | Reduce direct disaster economic loss in relation to gross domestic product of Myanmar by 2030 |
| 4 | Substantially reduce damage caused by disasters to critical infrastructure and basic services, including health and education facilities in Myanmar by 2030 |
| 5 | Substantially increase access to multi-hazard early warning systems and improve local disaster prepare |
| 6 | Substantially increased investment (government and development partners) on DRR in Myanmar by 2030 |

Table 5 2030 targets to measure changes in disaster impact (MSWRR, 2017)

International partners such as United Nations, Asia Development Bank, World Bank, Asian Preparedness Centre, and the Red Cross Movement are essential to the implementation and technical assistance for MAPDRR. International NGOs, local NGOs and CSOs are also engaged in many levels and roles. The Myanmar Humanitarian Country Team is the strategic humanitarian coordination and decision-making body to optimize the inputs. The Union of Myanmar Federation of Chamber of Commerce and Industries, in partnership with UNDP and UNOCHA, has established the Myanmar Private Sector Disaster Management Network.

Climate change adaptation

The 2012 Myanmar National Adaptation Program of Action (NAPA) to Climate Change identifies and communicates priority activities to address the most urgent and immediate adaptation requirements. The NAPA is a joint coordination between the Ministry of Environmental Conservation and Forestry and Ministry for Transport and complies with the UN Framework Convention on Climate Change. Of the 32 priority activities for effective climate change adaptation, there are eight main sectors and themes: Agriculture; Early Warning Systems; Forest Systems; Public Health; Water Resources; Coastal Zone; Energy, and Industry and Biodiversity. Each Ministry and Department is specifically assigned priorities, timeframes and achievements (Annex B (NECC, 2012).

The Ministry of Natural Resources and Environmental Conservation (MoNREC) in 2017 produced six policy guidance briefs on addressing and adapting to climate change for all sectors of society with a focus on food security and ecology. The Myanmar Climate Change Strategy and Action Plan 2016-2030 is currently in final draft with the MoNREC. This plan provides the vision for achieving climate resilient, low-carbon, resource efficient and inclusive development as a contribution to sustainable development. To support this vision, Myanmar is also developing its Green Economy Strategic Framework.

The 2015 Myanmar Intended Nationally Determined Contribution (INDC) confirm its commitment to climate change mitigation, by pursuing the correct balance between socio-economic development and environmental sustainability. The Myanmar INDC has identified mitigation actions and policies in the primary areas of forestry and energy, complemented by supporting policies in other sectors. Recently

transport, energy and mining legislation and policy plans and strategies from Ministries and Departments have outlined support for the INDC. The INDC additionally supports the Myanmar Government's stated commitment to increase attention to gender considerations in its climate change policy design, ensuring the full and effective participation of women in decision making means women can act as agents of change in all circumstances.

International and national partners continue to provide support and guidance regarding monitoring, assessment and predicting climate change. The 2017 Assessing Climate Risk in Myanmar: Technical Report lead by WWF and UNHABITAT with local NGOs Myanmar Climate Change Alliance and the Department of Meteorology and Hydrology and MoNREC, provides quality data and direction for all areas of Myanmar (Horton, et al. 2017)

Myanmar is also committed to engaging the private sector in long term environmental and climate change issues and tangible business cases. The commitment proactively implements environmental regulations around the industrial location suitability and protection of land and water, solid and liquid waste management and other related issues. The Myanmar government also currently has draft policies on renewable energy and the role of public and private partnerships, which will be completed soon. In 2015 a significant improvement in regulations and carbon emissions were introduced with many laws pertaining to the transport sector including the *Highways Law* and *Automobile Law*, the *Coastal and Maritime Law 2015* has taken account of the natural and unique ecosystems whilst aiming to reduce emissions and waste and the 2015 Myanmar Energy Master Plan.

Research Study

Rationale for the research study

There remains a gap in terms of the understanding about the nexus and interaction between poverty, disasters, climate change and vulnerability. There is a need to document and understand the disaster, climate change and poverty nexus to better guide government efforts towards more comprehensive policies and strategies and to enable development actors (including government line Ministries) to maximize the benefits from disaster, climate change and poverty related work in Myanmar. A research study was commissioned by the Food and Agriculture Organisation of the United Nations, to be undertaken by ActionAid Myanmar to contribute to the information available on the complex problem of the nexus of poverty, climate change and disasters in Myanmar.

Objectives of the research study

- Enhance the understanding of the nexus between disasters, climate change and poverty in Myanmar, as well the role of natural resources management in addressing these factors.
- Review, provide recommendations and consolidate effective models, especially community and ecosystem-based, pro-poor and gender-sensitive, poverty eradication, community-based disaster risk management, community-based adaption, and other models, to support building resilience in the agricultural and rural livelihoods sector at scale.
- Advocate and provide policy advice to embed successful models into national policy and planning processes; and
- Ensure alignment and synergy with developments in the countries involved in the research, Myanmar, Bangladesh and Vietnam while better targeting and designing FAO's interventions that can attract, and effectively utilize financial resources to support resilience options at scale.

Research questions

1. Do disaster, climate change and poverty have any interrelationship? What is the relationship and/or correlation between climate change, disasters and poverty in the selected study areas?
2. What types of climate change are happening in the selected study areas?
3. What types of disasters are occurring in the study area?
4. How are climate change and disaster events effecting livelihood activities, resources and materials in the study area?
5. What government interventions to address climate change, disaster and poverty are occurring in the study area?
6. What are the effective natural resource management policies and laws in the study area? How and why are they effective?
7. What are the effective models for disaster risk reduction, climate change adaption and poverty alleviation in Myanmar?
8. Are there any effective community-based disaster risk management, community-based adaption, poverty reduction, sustainable livelihood or other applicable interventions for strengthening the resilience of agricultural/rural livelihoods against climate change and disasters operating in the study area?
9. Are there any models of operation that could be consolidated to be more effective in Myanmar in the current circumstances?
10. Are there any models of operation that should be considered for implementation at the national level in Myanmar?

Research methodology

The research used a qualitative methodology in the field, supplemented by secondary data at the township level where possible, an extensive literature review and a consultation workshop of relevant actors from the government and private sectors to collaborate or challenge the preliminary findings.

- Township level workshops
- Township level key informant interviews¹³
- Village level focus group discussions
- Village level key informant interviews
- Literature review
- Consultation with relevant actors on preliminary findings

All findings and associated recommendations from the research have been screened to ensure validity and applicability using the following criteria.

- Only information obtained at the village level that could be cross validated from three independent sources was considered applicable for inclusion.
- Only information gained at the village level that was cross validated by those present at the consultation workshop, or through the literature review was considered applicable to be stated as a finding and to inform recommendations from the research.
- Only comments from those present at the consultation workshop that were consistent with the village level findings was included.

Area selection

Two ecological zones in Myanmar were selected by ActionAid Myanmar, the dry zone and delta zone, so that a comparison across the two major regions of Myanmar could be made.

Township selection

Three townships that are representative of the selected area were selected, Meiktila Township in the dry zone and Pathein and Ngaputaw Townships in the delta zone, all of which ActionAid have an ongoing program delivery presence. The presence of ActionAid Myanmar assisted the acceptance of the study team in the area and will assist the effective implementation of the study findings in the future.

Village selection

A total of 10 villages, five in Meiktila Township, three in Ngaputaw Township and two in Pathein Township were selected by ActionAid. Village selection criteria is illustrated in Table 6.

| Township | Name of village | Size of village | Geographical situation | Main livelihood |
|----------|---------------------|-----------------|------------------------|---------------------------------|
| Pathein | Tha Yat Wan Pu | Small | Inland and hilly | Agriculture |
| | Late Inn Kone | Small | Inland | Agriculture casual labourer |
| Ngaputaw | Ywar Thit | Medium | Riparian | Fishing and agriculture |
| | Oak Pho | Small | Riparian | Fishing and casual labourer |
| | Kone Kalay | Medium | Inland and hilly | Agriculture and casual labourer |
| Meiktila | Sue Yeitan | Small | Dry and inland | Agriculture and farming |
| | Let Pan Eint (West) | Medium | Dry and inland | Agriculture and farming |
| | Yae Ngha ThanBo | Medium | Dry and inland | Agriculture and farming |
| | Tel Hla | Medium | Dry and Inland | Agriculture and farming |
| | Yae Ngha East | Small | Dry and Inland | Agriculture and farming |

Table 6 ActionAid criteria for the selection of villages

¹³ There was some reluctance at the township level to speak openly and to share data without seeking permission from senior officials, this adversely affected the gathering of secondary level data.

Key informant interviews at township level, officer or Assistant Director level

| No | Departments for key informant interview |
|----|---|
| 1 | CSOs (INGO) |
| 2 | CSOs (NGO) |
| 3 | Department of Agriculture |
| 4 | Department of Meteorology and Hydrology |
| 5 | Department of Rural Development |
| 6 | Environmental Conservation Department |
| 7 | Fishery Department |
| 8 | Forestry Department |
| 9 | Green and reforestation Department |
| 10 | General Administration Department |
| 11 | Livestock, Breeding and Veterinary |
| 12 | Planning Department |
| 13 | Relief and Resettlement Department |
| 14 | Disaster Management Department |

Table 7 Key informant interviews

Participants in township level workshops in Meiktila, Pathein and Ngaputaw

| No | Departments for township level workshop |
|----|--|
| 1 | ActionAid |
| 2 | CSOs (INGO) |
| 3 | CSOs (NGO) |
| 4 | Department of Agriculture |
| 5 | Department of Meteorology and Hydrology |
| 6 | Department of Rural Development |
| 7 | Environmental Conservation Department |
| 8 | Fishery Department |
| 9 | Forestry Department |
| 10 | Green and reforestation Department |
| 11 | General Administration Department |
| 12 | Livestock, Breeding and Veterinary |
| 13 | Planning Department |
| 14 | Relief and Resettlement Department |
| 15 | Disaster Management Department |
| 16 | Head of Community Based Organisations (CBOs) |
| 17 | Head of Women Group |
| 18 | Village (Tract) administrators |

Table 8 Participants at township level workshops

Participant selection for village level Focus Group Discussions (FGD)

There were two types of focus group discussions, women only and a general group comprised of both women and men. The requirements for the groups was:

- Ten and above participants for each session
- Participants from different livelihood activities, including farming (dry and wet), livestock, fishery, grocery shop, casual labour, traders
- Equal gender in the mixed groups
- For the women only session, women from different livelihoods and different backgrounds.

Female only discussion group



Mixed gender discussion group



Village level Key Informant Interviews (KII)

The village level key informant interviews consisted of a minimum of persons, including the;

- Village head (administrator)
- Women's group leader
- Education group leader
- Community Based Organisations (CBOs)

Village level Key Informant Interview participants by organisation

| Type of respondents | Organization | Number |
|---|------------------------|--------|
| Village Administration | Village Administration | 10 |
| Head of Community Based Organisations women group | CBO | 20 |
| Farmer | Villager | 70 |
| Fisher men | Villager | 15 |
| Casual labour | Villager | 80 |
| Others | Villager | 60 |

Table 9 Key information interviews by organisation

Research Question 1

Do disaster, climate change and poverty have any interrelationship?

Yes, there is a clear, acknowledged and well documented interrelationship between disaster, climate change and poverty.

Poverty and the associated low socio-economic¹⁴ status have a direct inverse relationship on how individuals, groups and communities will be affected by climate change and disasters. The greater the poverty and lower socio-economic status of people the more they are affected by natural and man-made disaster and climate change events, the less ability they have to recover from these events and the less ability they have to safeguard against the effects of future disaster and climate change events. The recent upsurge in the intensity and occurrence of hydro-meteorological disasters driven by climate change underscores the need for an increased understanding of the nexus between disasters, climate change and the impacts on those living in poverty of these increasingly intertwined phenomena (UNISDR, 2009).

Disasters tend to hit the poorest and most marginalized demographics the hardest, with women and girls being particularly exposed to climate-change related disaster risk, and they are more likely to suffer higher rates of mortality, morbidity and economic damage to their livelihoods. Climate change will affect the risk from and impact of disaster in two ways, by increasing the frequency and severity of weather and climate hazards and by increasing communities' overall vulnerability to these hazards through factors such as long-term ecosystem degradation, reductions in water and food availability, reduction of natural resources, changes to livelihoods and associated social disruption. As acknowledged by the Relief and Resettlement Department in the participants guide Disaster Management Course 2012, the nexus of the underlying risk drivers, poverty, disaster risks and key interventions is illustrated in Figure 6.

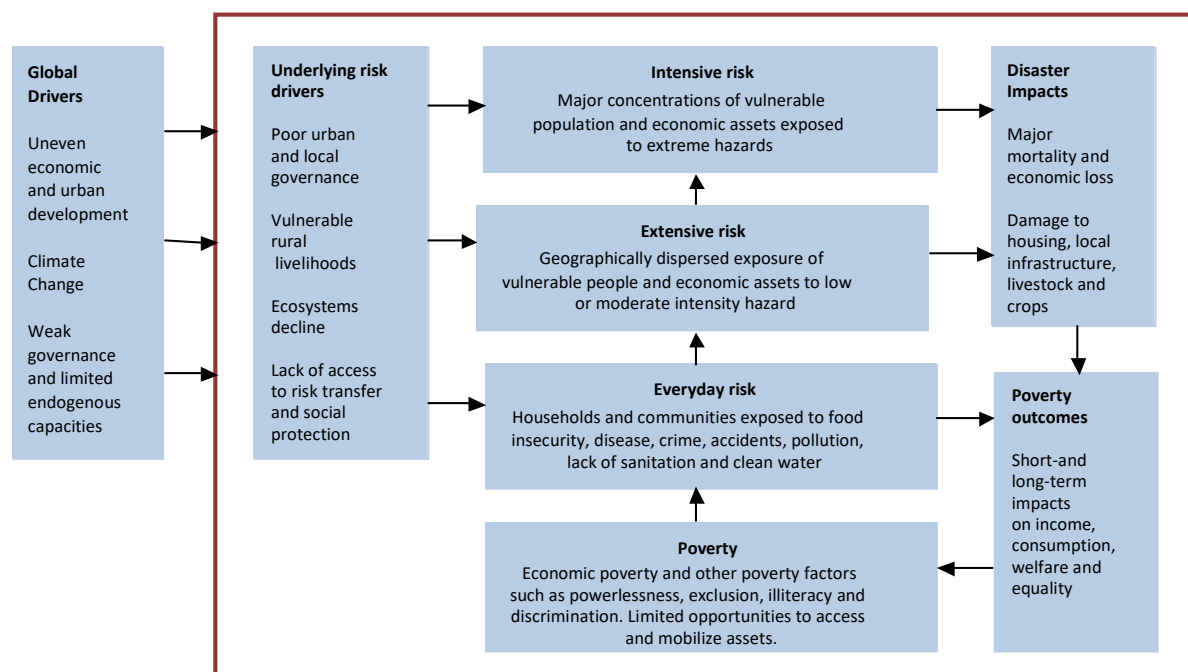


Figure 6 Nexus of underlying risk drivers, poverty, disaster risks and key interventions (Relief and Resettlement Department, 2012)

¹⁴Socio-economic status is defined as access to information, economic resources (level of poverty) and ability to exercise personal freedom of choice.

What is the relationship and/or correlation between climate change, disasters and poverty in the selected study areas?

Those living in poverty are predominately less well educated and therefore less able to analyse and interpret information, this limits their ability to plan and implement effective disaster risk reduction strategies. The low socio-economic status results in those living in poverty having less contact and less influence with persons in positions of authority and power and therefore are less able to advocate for disaster and climate change event preparedness infrastructure, strategies and planning and recovery in the areas which they reside.

People living in poverty also have fewer employment options and are therefore often ‘trapped’ in the default employment they were born into, have less ability to change their employment through education or training and have fewer life style choices due to having less disposable income, lower education and having to devote greater percentage of their time, energy, effort and funds to generating sufficient income to meet basic needs.

Due to having a lower income and lower disposable income, people living in poverty tend to commit all available funds to generating income. In agricultural communities this could be by buying more seed, more fertiliser, or purchasing more assets, such as leasing land, or purchasing cows or machinery to work the fields. In this context the loss of a single significant asset due to a disaster or climate change event can be life changing for those living in poverty and set in motion a chain of events which will eventually cause them to lose more assets, until they lose their principle asset, their land¹⁵. This finding is supported by finding in the recent Delta STRESS assessment in the Ayeyarwaddy (Vaughan, 2016).

Those living in poverty tend to live in areas more prone to the effects of climate change because they are less desirable and therefore cheaper, and the areas in which they live are less disaster and climate change event prepared. Their dwellings are a reflection of their socio-economic status and the availability of funds, are of lower quality and structurally less robust. The dwellings are therefore less able to withstand disaster and climate change events, and their ability to recover from an event is less, due to higher level of damage and lower availability of funds to repair or replace what was damaged or lost due to the event. “We can’t even prevent pests by reciting the Than Boke Day (Buddhist scripture)” Quote from a farmer in Ayeyarwaddy, whose village had experience pest outbreaks after flooding (Enlightened Myanmar Research Foundation and World Bank, 2017).

The climate change knowledge of people living in poverty is based more on hearsay information and less on science or factual information due to their lower education and limited access to information sources, so their ability to plan for and recover from an event appropriately is lower. Their ability to change the work they do is also very low, and if they wish to change, it almost always requires the person to leave the area in which they live and move to another district, state, or country. As those most likely to move are the younger, stronger and fitter generation, this reduces the seasonal labour pool¹⁶. Although there are reports that the remittances of those working abroad have benefited some families in the study areas, the availability of labour to assist in peak agricultural periods of planting and harvest is reduced, this causes those that remain, which are females with children, the elderly and the very young to work more often, longer hours per day and longer into old age. There is also an increase in the number of females with children becoming the head of the household, and having a greater range of duties and responsibilities, including being required to do hard physical work which would normally be responsibility of males. The Oxfam 2012 case study and Participatory Capacity and Vulnerability Assessment (PCVA) of Dedaye Township, Ayeyarwaddy supports these findings.

¹⁵ In village FGD, 60 percent of households are land owners, and 40 percent agricultural day labourers.

¹⁶ In the village FGD it was stated that 70 percent of those aged between 20 and 40 years had migrated. This correlates with the 2014 Census Thematic Report on Migration and Urbanisation Volume 4-D (2016), especially migration in the Ayeyarwaddy far outweighing the flow from other States/Regions.

Over a period of years, the interplay of all these factors leads to people living in poverty being heavily impacted by disaster and climate change events and having little or no ability to change their life circumstances to prevent further impact. This is progressively leading to them being temporarily and progressively permanently displaced due to disaster and climate change events. Due to having little or no choice where they move to, there are more and more people squatting on unimproved natural areas such as forests¹⁷, and on the outskirts of towns and cities. As defined by IOM (2011) forced migration is defined as; migration by those who have access to spare capital however minimal to seek better job opportunities due to slow onset disasters, rapid disaster events, and environmental factors, as a means of alternative employment and survival. In the Argyarwady Delta region (Foster, 2017) and the Dry Zone (Teerawichitchainan and Knodel, 2017).

This inevitably leads to friction with the previous local residents, as the newly arrived residents are without doubt using food and shelter resources that were previously available only to the local residents¹⁸.

The Government of Myanmar has worked to define the differences, similarities and interaction of disaster risk reduction and climate change adaption, shown below in table 10. This material is used in the Relief and Resettlement Department's Disaster Management Course.

Complementarily

| Disaster Risk Reduction | Climate Change Adaption |
|--|--|
| Disaster Risk Reduction (DRR) practitioners are concerned about the increase in climate and disaster-related risks in the past three decades, affecting developing countries and reversing hard-won development gains. | As evidence of global warming impacts continue to mount, climate change experts, policy makers and practitioners are convinced of the urgent need to respond to these changes by enabling governments and communities to adapt to their potential impacts. |
| DRR community has developed a significant body of knowledge and tools for managing climate-related risks associated with natural variability in the climate system. | Climate change scientists continue to improve models that predict the impacts of a changed climate under various scenarios - information of enormous value to those working at reducing risks from weather events. |
| DRR community has important experience in making the case to decision-makers about the benefits of preventive action and in "mainstreaming" such action into development and sustainable practices. | The issue of climate change enjoys global international attention and is supported by binding legal agreements. |

Differences

| Parameters | Disaster Risk Reduction | Climate Change Adaption |
|------------|---|--|
| Scope | Goes beyond climate-related disasters hydro-meteorological (torrential rain, floods, droughts, storms) and geomorphological (earthquakes, volcanic eruptions) hazards | Focus on changes in average climatic conditions and climate variability, which may modulate the vulnerability to certain disasters |

¹⁷ In a FGD village, it was stated that people from outside the area are living in the local forest in "slums".

¹⁸ An in-depth impact is described in Swe, M., et al., Farmers perceptions of and adaption to climate change impacts in the dry zone of Myanmar.

| | | |
|-------------------|--|---|
| Physical Exposure | Natural hazards, onset cannot be prevented | Anthropogenic, hence within the capacity of humans to influence their exposure to climate change |
| Mitigation | Limiting the adverse impact of a particular hazard, but not the onset of the hazard itself | Amount of greenhouse gases can be reduced or eliminated; will influence the rate and magnitude of climate change |
| Time horizon | More concerned with the present Emphasis is placed on vulnerabilities revealed through past disasters Focus tends to be more on near-term trends (the next 5-10 years) rather than long-term changes | In anticipating climate change, the scientific and policy debate usually takes a much longer time horizon than disaster risk management Climate projections are usually made for the next 20, 50 and 100 years. 2025, 2050 and 2100 often represent the reference years of comparison to present day situations. |

Table 10 Climate change adaption and disaster risk reduction (Relief and Resettlement Department, 2012)

Disproportionate impact on females of the climate change, disaster, poverty nexus

More females are killed and more females suffer a greater range of significant injuries in disaster events due to being the carer for others less capable (WHO, 2011, UNDRR, 2011). Females are more likely to have additional income generation responsibilities, such as running a shop, or weaving to supplement the family income placed on them (Nelson, 2011).

Females are more vulnerable than males to exploitation if they migrate to other areas for employment opportunities, particularly if the migration is forced by disaster and climate change events (Stapleton et al., 2017). Females are more adversely affected by outward migration if they remain in the community, their range of responsibilities increases, including become the de-facto becoming head of the households, in addition to being the primary (often only adult) carer of children, being the carer for the elderly and infirm, in addition to being responsible for the management farm, and actively working on the farm (Griffiths and Ito, eds. 2016). Supporting the findings of the study, the Women's Protection Technical Working Group reported in 2010, post Cyclone Nargis that 14 out of 100 households were headed by women, the majority being widows, sixty percent lived in unsatisfactory shelters and eighty percent report being in debt.

An opportunity does exist through the engagement of women in disaster risk mitigation and preparedness. In forming Village Disaster Management Committees, ActionAid work as part of the Myanmar Consortium for Community Resilience found in the delta area the women were self-initiating to take responsibility and key decision-making roles in disaster prevention. Not only did women see themselves as more suitable than men in the roles but they also 'seek merit' by assisting others to reduce the impact of disasters. In the Aung Hlaing village women occupy 36 of the 48 positions associated with the Village Disaster Management Committee and the three tasks forces on early warning, first aid and search and rescue (ActionAid and European Union, 2014).

In summary

People living in poverty are impacted more severely by disasters and climate change events, have a lower ability to recover, are subsequently affected for longer, are affected over a wider spectrum of factors including income generation, health, education, employment and livelihoods, and have a very limited ability to make life-style, livelihood, housing or employment changes to reduce or prevent further impact.

People living in poverty have very limited ability to advocate effectively with those in decision making roles for changes to protect their families and communities from climate change and disaster events.

People living in poverty, tend to associate and socialise with individuals and groups and intermarry others of the same socio-economic level, this is predominantly due to being able to talk and interact in comfort with likeminded peers, but results in poverty levels being maintained over generations.

People living in poverty are most severely impacted by others displaced by disasters and climate change from outside their area seeking to supplement their living in the areas traditionally only used by local residents, such as fishing in streams and rivers, or harvesting other natural resources.

Research Question 2

What types of climate change are happening in the selected study areas?

Climate change and disaster events are becoming increasingly interrelated, the mutually reinforcing relationship between climate change and disasters is growing stronger, and for all practical purposes are becoming inseparable (IPCC,2007). Almost 90 percent of deaths in disasters occur in hydro-meteorological disaster events, such as storms, heavy rainfall events, floods and the associated landslides, and climate change increases the intensity and frequency of extreme hydro-meteorological events (UNDP, 2013). Climate change is also the driver behind slow onset disasters such as droughts and rising temperatures and the associated heatwaves and extreme heat spikes (World Economic Forum, 2016).

Increasingly large-scale hydro-meteorological disaster events are being preceded by smaller scale long onset hydro-meteorological events such as those being consistently reported in the study areas, which increases vulnerability and decreases adaptive and recovery capacity and recourses. The recovery from major events is also more difficult as increasingly 'things do not return to normal' after an event, as what is normal is changing, due to climate change. This was very evident from the village level reports in all areas of the study and from scientific observations over time, as shown in the satellite Figure 8 and Figure 9 of the Ayeyarwady Delta below, taken 43 years apart (USGS, 2018).

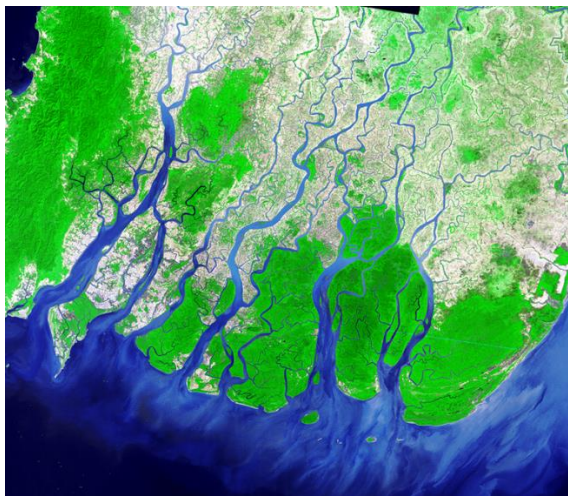


Figure 8 Landsat 1 Ayeyarwady delta Jan 1974 (USGS,2018)

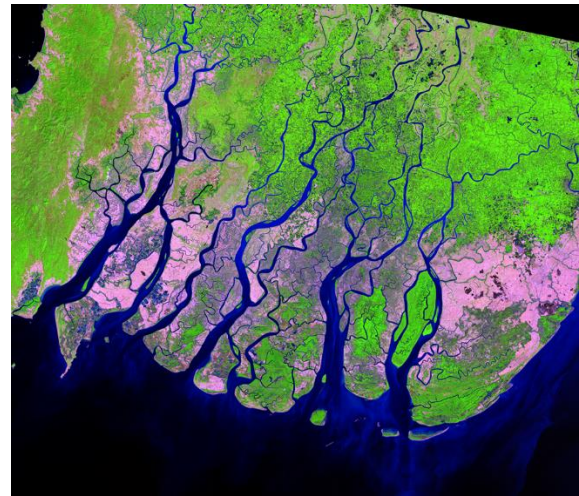


Figure 9 Landsat 2 Ayeyarwady delta Feb 2017 (USGS, 2018)

The Ayeyarwady Delta, is a vast alluvial floodplain, which spans over 35,000 km and was once home to an extensive tract of mangrove forests, but deforestation has changed the landscape. One scientific study estimated that the delta lost 1,685 km over the 40 years between the Landsat images above (Ibid, 2018).

Factors affecting climate change can be categorized into four groups, among them deforestation and related causes were mostly cited as the major causes of climate change. Deforestation has occurred in the dry zone for various reasons, including land conversion, logging, charcoal making and dam construction. Swe et al., (2015) found that overall more than 90 percent of the reported causes of climate change from farmers fall under the category of anthropogenic causes, and therefore dry zone farmers are aware of that climate change has happened and is due to anthropogenic causes.

Dry zone

- Flood and drought (increasingly in different seasons of the same year)¹⁹
- Reduction in crop yields due to changes in rainfall patterns
- Crop failures due to changes in rainfall patterns, including flooding and short droughts
- Soil erosion due to heavier rainfall, leading to loss of arable land
- Increased occurrence and intensity of water shortages for human, animal and agricultural use
- Reduced animal fodder production due to soil degradation and changes in rainfall patterns
- Increased occurrence and intensity of outbreaks of agricultural pests due to higher humidity (increased rainfall and number cloudy days)
- Mass dying of small farms animals due to extreme temperature spikes²⁰
- Outbreaks of fungal infections and respiratory disorders in community residents, which were previously unknown, therefore there is no traditional treatment, and no readily available and affordable pharmaceutical treatment.

A number of recent studies and reports support these findings including; FAO Investment Centre (2014); IWMI (2015); Mercy Corps (2015a); Mercy Corps (2015b); Swe, et al., (2015); ADB (2015); ADB (2016b); Van Hamelrijck (2017); Tun Oo, Van Huylbroeck and Speelman (2017), Johnston et al., (2017) and Myanmar Environment Institute (2017). The impacts are predicted to increase as existing historical data and climate projections indicate that variability and the intensity of rain events will continue to increase, which will further drive erosion and reduce soil quality in the dry zone (Mercy Corps, 2015).

Delta zone

- Flood and cyclone
- Fire in the fields and villages, due to hotter drier conditions in the dry season
- Water shortages (wells are drying up, in the dry season)
- Crop failures due to changes in rainfall patterns and increasing salinity
- Crop failures due to salt water intrusion upstream, caused by inconsistent rainfall to keep rivers flowing
- Increase in occurrence and severity of outbreaks of agricultural pests
- Fish stocks dramatically declining due to loss of habitat (cyclone), salt water intrusion due to rising sea levels and due to these factors over fishing by locals and non-locals and use of unsustainable fishing practices
- Wild elephants destroying fields as they seek food, due to loss of elephant habitat and shortage of natural food sources.

A number of recent studies and reports support these findings including; UNDPHDI (2013); UNDP (2014); ActionAid Myanmar (2014); Driel and Nauta (2014); MCCR (2015); Vaughan (2016); Win and Thinzar (2016); LIFT (2016a); Newall (2017) and Aye (2018).

¹⁹See Annex C for a case study confirming water shortages and strategies to address the shortages (UNDP, 2018b).

²⁰ See Annex D for a case study confirming the heat stress to animals and the new breeds to address the heat (UNDP, 2018c)

Sociological impacts in both the dry and delta zones

- Younger people are migrating away from the agricultural areas to the larger towns
- Whole families are having to move to other towns or cities with better job opportunities
- Shortage of skilled labour in the region hinders the completion of agricultural practices
- General and widespread loss of confidence in agriculture being a lifestyle for the future
- Loss of ability to support monastic activities including monastic schools and orphanages and to make donations of food and goods to monasteries, which gain the person merit

What types of climate change are happening in Meiktila Township?

Socio-ecological setting of Meiktila Township

Meiktila Township is situated in the central dry zone of Myanmar, the township is 338 north of Yangon and 96 miles south of Mandalay on the Yangon-Mandalay highway and is situated at the junction of four main ASEAN roads which connect to India, China, Thailand and Bangladesh. Due to the strategic position there are several military bases, Myanmar air force's central command and air base, industrial zones, universities, colleges, district hospital, and a military hospital are located in the township. The population as at the 2014 census was 309,663 persons with the medium age of 29 years (Department of Population, 2017b).

The dry zone of Myanmar is located in the central part of the country and is characterised by periodic acute scarcity of water, infertile soil, degrading soil and severe soil erosion in the monsoon season. The landscape of the dry zone is undulating, and soils are mainly sandy with some clay and sandy loam in the valley bottoms. Soils are generally nutrient poor and shallow and are easily eroded by intense rains and strong winds. Almost all of the rain falls in the monsoon period from May to October, rainfall is increasing and becoming increasingly erratic, but all the additional rain is still falling in the same short period, increasing soil erosion and flooding. Droughts are also becoming more common and more severe, due to changes in surface water flows, low moisture retention capacity of the soil, soil erosion causing large gullies in farm land and extreme temperature spikes in the dry season. The World Food Programme rated drought as the major agricultural production problem of the dry zone in 2011.

The main crops are sesame, pigeon pea, green gram, groundnut, cotton and sorghum. Yields are generally low, and crops are increasingly failing due to the irregular rainfall and overall changing rainfall patterns. The population density is relatively high, and there is a trend towards fragmentation of landholdings, as land is divided amongst children. In order to survive, farmers are increasingly forced to cut trees for cooking fuel and to sell as charcoal, cultivate marginal areas with poor soils, and graze cattle and other small agricultural animals on scant natural vegetation. This leads to further soil erosion resulting in gullies forming in the remaining farmland, which is increasingly making previously valuable farm land unviable. A detailed analysis of land capability and soil erosion is provided in Kyaw, Nyo and Rayamane (2016).

In Meiktila Township, there have been large infrastructure projects including the construction and operation of a hydro-electric dam, which have contributed to the adverse effects of climate change, most notably the loss of arable land, and changes to the previous easy access to the water supply for household and agricultural use west of the dam, which are rain dependant²¹. In particular the change in rainfall patterns over the 17 years of this century has been very significant. This has resulted in a substantial increase in the measurable amount of rainfall without an increase in the number of days that rain was recorded, therefore the rainfall is heavier and more destructive.

There was a 30 percent increase in the average of the rainfall recorded over the last eight years when compared to the first eight years of this century, and the increase is accelerating with rainfall in the

²¹ Areas east of the dams have access to irrigation water from the dam

three years 2015-2017 being 300 percent higher than that recorded in the three years 2001-2003, see Figure 7 below (Department of Meteorology and Hydrology, 2018).

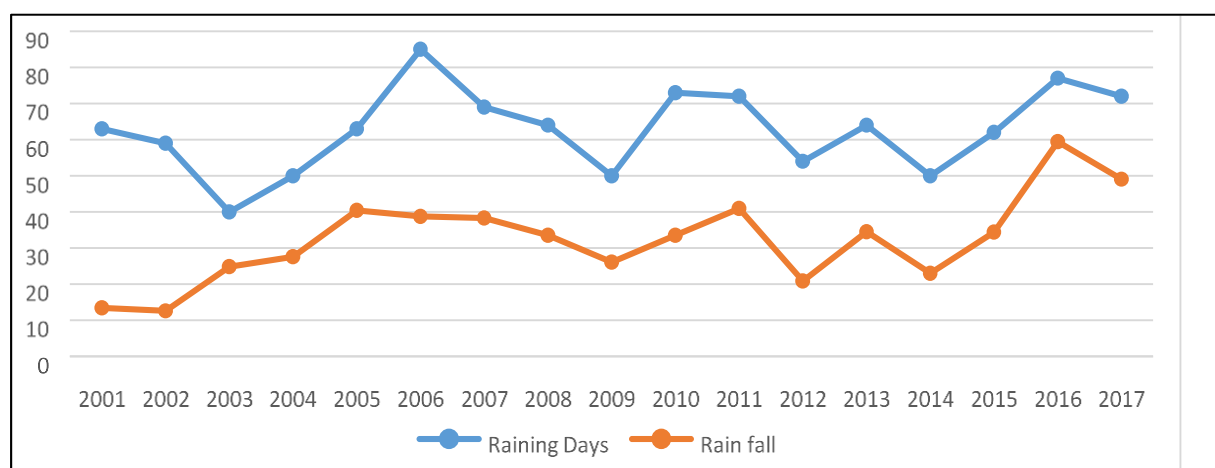


Figure 10 Days of rainfall and amount of rainfall, Meiktila Township 2001-2017 (Department of Meteorology and Hydrology, 2018).

Hydro-metrological changes

Increased rainfall and an associated increase in humidity due to both the higher rainfall and a large increase in the number of 'dull cloudy days', in addition to regular extreme spikes in temperature is having a range of negative consequences on the younger and more elderly community residents, both small and large livestock, and is causing a significant increase in the range and severity of crop diseases and pests²². The severity of rainfall has also led to a corresponding rise in soil erosion level, and large crop losses due to soil and crop being washed away soon after planting. These changes were confirmed in the presentation of preliminary findings and consultation with government agencies workshop held in Nay Pyi Taw on 10th April 2018. A first-hand account from a 2017 ActionAid case study of a Meiktila farmer in Let Pan Aing Anauk Village found from the beginning of mid-October, Meiktila experienced daily rainfall over six weeks causing sunflower and maize crops to fail due to infestation of insects and this had been the first time in 40 years it had rained in October in the area, (ActionAid Myanmar, 2017a). The study team concluded this was clear evidence of the impact of climate change on the environment in this area.

Quotes regarding hydro-metrological changes from the focus group discussions include

"There has been a big increase in temperature. Even in winter, it becomes too hot at about 7:00 a.m. We become so hot and itchy"

"In periods when there were irregular patterns of rain, chicken and pigs got infected, likewise, cows suffered from Foot-and-Mouth Disease²³".

"Due to changes in weather conditions, goats had diarrhoea and chickens were infested with disease".

"Because of the dam, the areas of land for pasture got smaller. As a result, those who didn't own any land had to sell their cows as it was".

"Changes in weather conditions had effects on domestic animals, pigs got infection, about 50 or 60 pigs died this month."

"Goats got sick and died. Changes in weather conditions made goats suffer from diarrhoea. The pasture becomes smaller in area because of flooding."

²² Focus group discussion held in village

²³ Which also limits markets especially exports (JICA and Sanyu Consultants Inc., 2013)

Quotes regarding infrastructure construction from the focus group discussions include

“Some farmers lost their farms in construction of the dam and those who, at first, were landowners had to rid of their ownership of land. Although compensation was granted, the amount was not significant and was not supportive”

“Crops submerged in water while raining and in time of flooding caused by the dam. Even though electricity can be generated from dam-water, there was no electricity in Yae Ngan village”.

Crop production

The major crops grown in the area are paddy, soybeans and several varieties of beans, pigeon peas, cotton and jaggery for the production of palm sugar. Soybeans and sesame have to be planted at the onset of the monsoon, but due to the progressively later arrival of the monsoon, and corresponding less time between sewing and harvest, crop production has reduced as supported by the IWMI 2013 rapid assessment (IWMI, 2015). There was also four years in the past ten when soybean and sesame could not be grown, and some years when a significant percentage of the crop was lost due to being washed away by the increasingly heavy rain. There has also been reports of increased number and variety of pests attacking crops due to the increase in cloudy weather and associated increased humidity, requiring increased use of pesticides²⁴. All of these factors in addition to a loss of arable land due to the construction of the dam and soil erosion has led to an increase in crop inputs and a significant reduction in crop outputs²⁵, which has led to a correspondingly large drop in income. This was also supported in the presentation of preliminary findings and consultation with government agencies workshop held in Nay Pyi Taw on 10th April 2018.

Quotes regarding agriculture cropping from the focus group discussions include

“Agriculture can’t provide dependable source of income, plants will likely to be infected with pests while it is cloudy and raining.”

“As it rained unconditionally, the crops were infested with pests, this year, pigeon pea plants are cut down and set into fire, butter bean plants are also infested with pests and some farmers don’t get food even for cows.”

“Once sesame yield per an acre was 7 to 8 baskets now only 2 to 3 baskets”

“Heavy rain overflows the dam and causes flooding, causing devastating effects to tomato and chilli plantations”.

“Degraded soil quality causes reduction in yielding, for better yielding, it is essential to use more pesticide and fertilizer and this incurs higher charges for crop production”

“Cultivation and harvesting cannot be done at the right time due to shortage of labourers and this has negative effects on crop yielding”.

“A well-qualified crop is not attained due to pest infection; disqualified crops can’t be sold and thus have to be used as food for cows”.

Social environment

The onset, spread and severity of fungal infections and diseases are closely correlated to increases in humidity, and this is being reported as impacting most severely on the very young and elderly members of the community. Also, the impact and effect on vulnerable people from types of infections and diseases not previously encountered is exacerbated by the person infected and the carer not

²⁴Mercy Corps, 2015b highlights the common pests of dry zone crops included pot borers (chickpeas), aphids (sesame), army worms (nuts, beans, sesame), and boll worms (cotton).

²⁵ Farmers have reported that overall agricultural production has fallen by 20 percent in some villages.

recognising the early symptoms or knowing how to respond effectively in a timely manner, there being no natural remedies, and the pharmaceutical remedies not being readily available.

There were many reports of income from agriculture dropping to the point where it was no longer viable, as the earnings from the sale of crops was not sufficient to cover the increasing cost of inputs, this is leading to an overall loss of confidence that traditional farming and the associated social practices will exist in the future.

Due to both the reduction of income from agriculture and rapid modernisation of Myanmar, which has generated a range of non-farm employment opportunities, there has been a very significant increase in outward migration of young fit males and females and several reports of whole families, which have given up agriculture and moved to the cities for work. Griffith and Ito eds. (2016), provide evidence that a third of households' report increased workloads on those left behind when a family member migrates.

Quotes from the focus group discussions include

"Due to irregularities of climatic conditions, losses of crops are experienced. So, some farmers move to other villages and engage in rock mines."

"There are some villagers who pick up weaving as their main living as agriculture can't support them to make both ends meet because of a number of causes such as drought, and heavy rainfall while raining".

"Farmers are not keen on farming anymore and most of them would like to migrate to other regions for a number of reasons such as unstable market for crops and fall in crop price".

"Prices of crops fall and trading is not good. Most of the people are fed up with the current situations and they would flee to other regions to work there".

"Like men, women tend to work in foreign countries as migrant workers²⁶".

"Women at the village join the workforce in farming sector".

"There is an upward trend in the number of workers who move to other regions or foreign countries for better job prospects, resulting in shortage of labour in the village".

Livestock

There have been numerous cross validated reports of a mass dying of goats, large losses of small livestock such as chickens, large losses of pigs, and an increase in the disease range, prevalence and severity in cows due to the higher humidity, and temperature spikes. There have also been cross validated reports of lower availability of land for grazing, lower overall fodder availability and lower fodder quality, due to the increasingly erratic rainfall patterns and soil erosion due to the heavier rain. The pressure for food, fodder and forage places greater pressure on the agroforestry landscape and further impacts on ecosystems (Bann, et al., 2017).

Quotes from the focus group discussions include

"Last year the prices were extremely low since the goats were too small in size. No one wanted to buy them".

"When a sick goat was given, there was not anybody who would like to take it."

²⁶ A Meiktila farmer recounts the heartbreaking decision to borrow money to send his second eldest daughter across the Thai border to work illegally in Bangkok in a poultry factor to send money back to support the family and five sisters. The decision was based on the fall in sap production over the past 10-15 years in the family's toddy palms and the increasingly poor production due to lack of rainfall (ActionAid, 2013).

“In periods when there were irregular patterns of rain, chicken and pigs got infected, likewise, cows suffered from Foot-and-Mouth Disease”.

“Due to changes in weather conditions, goats had diarrhoea and chickens were infested with disease”.

“Changes in weather conditions had effects on domestic animals, pigs got infection, about 50 or 60 pigs died this month.”

“Cows were not affected but goats got sick and died. Changes in weather conditions made goats suffer from diarrhoea. The pasture becomes smaller in area because of flooding.”

“We had nothing to feed cows so the tubers of certain species of grass were used to feed them, the situations were terrible for five or six years.”

“Because of rain, goats caught cold and experienced hair-fall. They had stomach-upset too.”

What types of climate change are happening in Ngaputaw Township?

Socio-ecological setting of Ngaputaw Township

Ngaputaw Township lies to the south west of Yangon and to the south of Patheingyi Township, another of the townships in the study. Ngaputaw is in the Ayeyawaddy delta region and is situated where the delta meets the Andaman Sea to the south and the Bay of Bengal to the West. The delta area is comprised of low lying agricultural land, fed by rivers coming from the southern slopes of the West Yoma Mountain range. On the coastal region close to shore are the Gawingyi, Ohn Kyun Gyi, Khn Kyun Lay, Tha Mee Hla and Laik Kyun Toe islands.

The Ngaputaw Township has with a total coastal area of 108 miles, is comprised of two wards, 50 village tracts. The with a total population as at the 2014 census is 168, 776 being 167,294 households and of which 10,421 are urban households and 156, 873 are rural households (Department of Population, 2017c).

The population relies predominantly on agriculture for their livelihood, with the principle crop being paddy rice. After the paddy rice harvest a range of fruits and vegetables including water-melon, cucumber, betel nut, beans, chilli, ladies' finger (okra), and brinjal (eggplant) are grown for local consumption and local trading. This is supplemented by small scale livestock breeding and small-scale freshwater fishing for both local consumption and local trading and sale.

In 2015 and in 2017, Ngaputaw Township experienced significant flooding. Due to the large coastline exposure, Ngaputaw was also extensively affected by cyclone Nargis in 2008, casualties were high²⁷ and most people in the area experienced a long period of lack of food and water supply after Nargis.

People from Ngaputaw Township are also progressively encountering inadequate water supply, due to temperature spikes, increasing evaporation and increasing salinity in underground water supplies making the water unpotable. Some villages situated by mountain creeks are increasingly living with the damage caused by heavier rainfall patterns, causing crop losses and long-term soil erosion. Areas closer to the sea are experiencing salt water intrusion earlier in the year²⁸ and further upstream than historically recoded, due to decreased water flows in rivers and streams, and rising sea levels. This was

²⁷ The 2017 Baseline Survey Report, Ayeyarwady Region, Myanmar reports 5,348 people died and 435 were injured, 80 percent of houses and 75 percent of other infrastructure were destroyed due to Cyclone Nargis (Newell, 2017).

²⁸ 21 days earlier in 2017, this figure was confirmed in the presentation of preliminary findings and consultation with government agencies workshop held in Nay Pyi Taw on 10th April 2018. The International Rice Research Institute is currently undertaking salinity mapping in the Ayeyarwady to gain a full overview of rising salinity levels (LIFT, 2016a).

also supported in the presentation of preliminary findings and consultation with government agencies workshop held in Nay Pyi Taw on 10th April 2018.

Hydro-metrological changes

Increased severity of rainfall during the monsoon season, changes to the overall rainfall patterns, and progressively more regular extreme spikes in temperature are having a range of negative consequences on the health of younger and more elderly community residents, both small and large livestock, and is causing a significant increase in the range and severity of crop diseases and pests²⁹.

The changes in rainfall patterns have led to an increase in salt water intrusion into streams and rivers, due to lack of consistent rain to keep the freshwater flowing downstream and rising sea levels. The irregular rain patterns have caused a rise in pests and fungal diseases in a wide range of crops. The severity of rainfall has also led to a corresponding rise in soil erosion, and large crop losses due to soil and crops being washed away soon after planting. The STESS assessment of the Ayeyarwady delta by Vaughan (2016), supports the findings of the Ngaputaw Township findings.

Fishing

There were multiple cross verified accounts from the focus group discussions conducted in the villages of the catch of Hilsa³⁰ dropping significantly since cyclone Nargis in 2008, the drop has been so severe that the great majority of people who fished for a living prior to 2008 no longer do so, saying it is no longer viable or profitable. This is supported by the finding that the reduction in the Hilsa catch and changes in fishing regulations and net requirements are combining to significantly decrease subsistence fishing in the region (Enlightened Myanmar Research and World Bank, 2016). The reduced catch has led to unsustainable practices being used by those who continue to try and make a living from fishing, and whilst it is not only people from outside the local area that are using the unsustainable practices, most are not from the local area, but come only to fish and then leave, this is leading to friction between local and non-local fishermen. The unsustainable practices include using nets with smaller mesh to catch small fish, using electric shock from large batteries and putting drugs in the water to stun the fish. All of these practices allow for fish of all sizes at all periods of the breeding cycle to be harvested, this is interfering in the breeding cycles and further reducing the catch each subsequent year.

There were also several reports, which were verified by groups discussing agricultural practices that there has been a significant increase in the use of fertilisers and pesticides due to the degraded soil and the increase in pest infestations, the run off from this is highly toxic to the fish and is causing the fish stocks to further deplete. This is supported in the findings of Driel and Nauta, (2014) including an assessment of the Cyclone Nargis impact on aquaculture.

Quotes from the focus group discussions include

“Now, Hilsa can’t be caught a lot. Before Nargis, it was caught a lot. Later, the catch of that certain type of fish is not satisfactory.”

“Hilsa netting is somewhat like winning the lucky draw as it is rarer. It is found today but for the next week you may not catch it.”

“The catch of Hilsa is not very good, having no capital, we did that business last year but in vain, it was unprofitable.”

²⁹ Focus group discussion held in the village. As supported by Driel and Nauta, 2014 in ‘Full assessment of the vulnerability and resilience of Ayeyarwady Delta’.

³⁰ Further information regarding Hilsa in Myanmar is available at Boblme, 2015.

“Once, the netting was 4 inches and thus only fish weighing about forty-five ticals were caught, now the netting is less than 1 inch and very small fish weighing less than five ticals are being caught, this is depleting the overall fish resource”.

“There are fishermen who use batteries and drugs in fishing,”

“Since the drug is applied at the very beginning of the creek, the whole creek is affected, due to this practice, fish resource is shrinking.”

“There was a shortage of fish since fishermen from other villages did drug-reliant fishing and this caused the death of marine creatures”.

“In agriculture too, pesticides killed fish and prawns”.

Livestock

Livestock is bred in the area for agricultural purposes and for personal consumption. The cows bred for agricultural use are becoming unviable due to the reduction of available feed and increased requirement for vaccinations³¹, which are now required every six months due to the increasing regularity of fungal based and parasite disease outbreaks. The additional agricultural inputs associated with veterinary costs are further eroding the bottom line viability of farming in traditional ways.

The combination of altered rainfall patterns, increases in fungal type diseases, and temperature spikes, is causing regular large losses of small livestock, particularly chickens, but also goats and pigs which are being infected with respiratory reproductive syndrome, to the extent where pig farming is becoming unviable, due to the high input costs, and the constant threat of disease outbreak. The National Adaption Program for Action (NAPA), 2012, identified the linkage of the high rate of fungal diseases and pests and climate variabilities in the delta area and also identified the need for greater veterinary services and knowledge, the solutions remain undefined.

Quotes from the focus group discussions include

“There are more frequent death of poultry and domestic animals like chickens, ducks, pigs and goats”.

“Poultry and domestic animals such as chicken, duck, pig and goat are raised on a small-scale basis, if it is too hot in summer, animals may be infected by deadly diseases. Throughout the year, both chickens and ducks died in flocks due to infection”.

Forest related activities

Nipa palm was the traditional source of thatch for roofing local houses, this has now predominantly been replaced by zinc roofing iron. Large numbers of nipa palm were cut down to increase rice paddy production when the wholesale price of rice paddy rose by over 25 percent in 2013 and more recently the remaining nipa palm trees have become infected with a fungal disease and are dying off. Both of these factors combined have effectively ended the production of nipa palm thatch as a means of earning income, very limited amounts are produced for domestic use, but this is steadily declining. The 2015 BOBLME project assessment also found the reduction in nipa thatching production significantly impacted upon women in poor households as it was one of the few economic activities they could undertake and now demand had ceased. These findings were also supported by township level program managers in the presentation of preliminary findings and consultation with government agencies workshop held in Nay Pyi Taw on 10th April 2018.

³¹ The 2015 LIFT program review sampling 50 delta villages found that vaccinations and injections required for livestock and provided by funders was incorrect and resulted in the death of livestock, thus a lack of due diligence and local knowledge by well intending external providers also impacts on village farmers.

Trees are being cut to produce charcoal for household use and for sale to supplement household income, but there is no systematic replanting. There is also illegal felling and trading of wood and cutting of mangrove forests, for use as firewood.

Paddy farming

There were multiple cross verified accounts from a wide range of focus group discussions held in three villages in Ngaputaw township that rainfall patterns have altered significantly. This was also supported in the presentation of preliminary findings and consultation with government agencies workshop held in Nay Pyi Taw on 10th April 2018. Whilst the different discussions mentioned different specific instances occurring in different years, the overall message was consistent and very clear, the rainfall patterns are no longer predictable, have caused large crop losses and have caused several farmers to abandon growing certain crops that require predictable rain patterns, in particular mung beans. The altered rainfall pattern has caused paddy crop losses of 50 percent in five of the last ten years due to late arrival of rain delaying sowing, raining late in the growing cycle causing fungal disease outbreaks and pest infestations, and raining during harvest season preventing the drying of the grain and once again causing outbreaks of fungal diseases and pests. In addition to lowering crop yield, this causes blemishes on the crop, reducing its saleability, and if it can be sold the sale price. This is supported by the assessing climate risk in Myanmar report, which found that the intensity of the wet season has increased rainfall in the near and long-term, and flooding will increase as a result (Horton, et al., 2017).

These conditions have led to the increased use of fertilisers to try and increase the yield, and a dramatic increase in the use of pesticides, to try and control the pest infestations. It was admitted by those attending the focus group discussions that there was little or no inherent knowledge or training in regard to the use of the agricultural chemical inputs, leading to their overuse 'to make sure' that it was effective. The run off from these practices is affecting the quality of the local drinking water supply, this and the fact that wells are increasingly running dry in the dry season is causing a range of practical and social problems. Rain water tanks are now one of the items most needed in the area, and whilst it is possible to have rain water tanks now due to the increased use of iron sheeting for roofs, a decade ago they were not required. The run off from the use of pesticides is also contaminating local streams, causing fish stocks and fish catch to drop significantly³².

Quotes from the focus group discussions include

"Now every year, in April and May, weather shortages take place and we have to fetch water from other villages. In previous year, the conditions were quite worse as we had to rely on supply of water from others."

"The situations were not normal in 2104-15 but in 2014 we experienced shortages of water both for drinking and domestic consumption until June. But situation got a bit better in 2015 in comparison with 2014. In 2014, we had to go to other villages to get water."

"In 2015, there were donations of water from well-wishers".

Quotes from the focus group discussions (regarding paddy) include

"Sometimes, paddies are infested with pests."

"Once, it did not rain at the time of harvest, where as it does now."

"In 2015, rain receded earlier, paddy production was affected and the yielding was poor."

"In low-lying land, due to the blending of fresh water and salt-water, farmers lost a big amount of paddy."

³² LIFT, 2016a also found further impacts of pesticides on aquaculture and small-scale farming such as home gardening and eel farming poisoning occurred during the summer paddy cultivation.

“Heavy rain caused salt-water to increase and made the paddy sprouts fail”.

“This year too because of destructive rain, they disqualified my paddy grains.

“In 2017, while paddy grains were blooming, it rained a lot. Likewise, it rained at harvest, too. These conditions caused harmful effects to paddy”.

“In spite of having enough land to grow winter and summer crops, there was not enough water to grow such crops, rain is not known now, like it used to be”.

Social changes

The social structure is altering as farming and fishing become less reliable and less viable, people are seeking alternative employment. Young unmarried males and increasingly male heads of households are moving to the cities to work in the construction sector and young unmarried females to work in the textile factories (Griffiths and Ito, eds., 2016). This is reducing the agricultural workforce available for peak periods of sowing and harvest, further reducing the agricultural outputs of the area and disrupting the social fabric of family, community and village life to the point where many village residents see traditional village life as rapidly becoming history.

Although it is set between numerous creeks and rivers, there is no fresh water for drinking in many villagers in the township of Ngaputaw, the task of fetching water usually falls to the women and children, to get water for their various domestic activities, it is common to walk for two kilometres or more, each person can carry two plastic containers per trip with a capacity of 40 litres each trip, with several trips often being required. During the dry season, the probability of these water sources drying up increases, forcing people to walk even further for alternative water sources, which are now almost always contaminated (Aye, 2018).

The outward migration of younger males and females and younger male heads of households, is placing a very great responsibility on those continuing to live in the village, the young, the elderly and females with children, many of whom are now effectively the heads of their households. In addition to increased general family responsibilities and increased responsibility for a larger and more diverse range of farm work, there has been a very large increase in small shops attached to houses, where females or school age children sell small household items in an attempt to supplement the family income, this further reduces the amount of time and focus that can be attributed to agricultural pursuits. The qualitative social and economic monitoring thematic study, Country on the Move, undertaken by LIFT in 2016 (LIFT 2016b), also cites the household shocks such as health, injury, weather and disaster contributing the impact of migration on those remaining in the village.

Quotes from the focus group discussions include

“Residents flock to the big cities including Yangon for better job opportunities due to poor weather conditions, unprofitable fishery, and unemployment problems here in the village”.

“In 2016, casual labourer faced difficulties as it rained just before harvest time.”

“It is hard to find enough labourers especially in cultivation periods and at harvest. Thus, the tasks can’t be accomplished in time and there is loss of crops.”

“All my children are working in cities and we depend on their income.”

“As children send their income to us, we can rebuild our house. Once the houses were mere thatch ones, but now houses can be built with zinc roofs. Here, pig farming is unprofitable due to infection. As for agriculture, it is a failure because of flooding and pests”.

“It is noticed that by comparing the conditions before and after 2008, the regular harvest reapers are not available. Here, at the village it is difficult to earn MMK 5,000 a day whereas in a big city earning MMK 5,000 a day is rather easy. The working conditions are really opposite, our outlook and our conduct can be altered by working in the city, so we would choose the city.”

What types of climate change are happening in Patheingyi Township?

Socio-ecological setting of Patheingyi Township

Patheingyi Township lies 190 kms to the west of Yangon in the Ayeyarwady Delta region on the western side of the delta where the delta meets the Bay of Bengal, it is immediately to the north of Ngathay Township, which was also one of the study areas, and is the capital of the Ayeyarwady region. Patheingyi Township is located on the banks of the Patheingyi River, which is a western branch of the Irrawaddy, the port in the town is accessible to large vessels and is being considered by the current government for the establishment of a deep-sea port project and associated industrial zone.

According to the 2014 census the population of Patheingyi Township is 287,017 in 272,957 households, 114,738 households in rural areas and 158,219 in urban areas (Department of Population, 2017d). There are 15 wards and 39 village tracts and there is currently an unemployment rate of 2.35 percent (Ibid. 2017d). Those in rural agricultural villages and the surrounding areas rely predominantly on agriculture for their livelihood with the principle crop being paddy, supplemented by timber products, fishing, cashew nuts trees and vegetable growing. There are several rice mills and saw mills in the township area. After the paddy harvest a range of fruits and vegetables including watermelon, cucumber, betel nut, beans, chilli, ladies' finger (okra), and brinjal (eggplant) are grown for local consumption and local trading, small scale livestock breeding, small-scale freshwater fishing, and the production of sun dried salt are conducted for both local consumption and local trading and sale.

Patheingyi Township is in a very strategic position and will be part of a large project by the Ministry of Urban and Housing Development to develop projects encompassing Mandalay, Mawlamyine and Patheingyi areas with the assistance of the Japanese International Cooperation Agency (JICA) and a contribution of USD 300 million to the project from the United Kingdom Government³³. The Ministry chose these three cities due to the urban population being expected to double during the next 20 years, and the current transportation, basic infrastructure being appropriate for economic development and capable of supporting future prospects (Eleven Myanmar, 2015).

The Department within the Ministry has begun implementing six-month urban development plans for the three cities in cooperation with JICA, in preparation for the project implementation. The relevant government departments are also drafting urban planning law, procedures and rules and regulations for the three cities with the assistance of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) of Japan and JICA (JICA Study Team, 2016).

Patheingyi Township is being assessed for a deep-sea port project involving an industrial zone that has similarities with the Special Economic Zones (SEZs) in Myanmar's Dawei and Kyaukphyu areas. The Myanmar Construction and Development Public Company, in collaboration with the South Korea-based Korea Engineering Consultants Corp (KECC), is studying the feasibility of the project. If the current feasibility study confirms the port's viability, the project will be submitted to the government for final approval (Myanmar Times, 2018b)

In 2016, Myanmar Flora and Fauna International established a formal partnership for coastal biodiversity conservation in Myanmar. The partnership collaboration focuses on providing technical and capacity building support for the marine science departments of Myanmar's universities, in particular Patheingyi University, to lay the foundations for future involvement in biodiversity assessment, environmental impact assessments and monitoring.

The project also aims to develop a comprehensive baseline assessment of coastal and marine biodiversity in the nearshore area along the west coast of Ayeyarwady region, which is relevant to Woodside Energy's oil and gas exploration licence. From initial observations, this previously undocumented coastline includes a wide diversity of coral reefs, seagrass, mudflats and mangrove habitats. Under the partnership, the next step will be to identify key biodiversity areas and their

³³ Statement by Andrew Patrick, the British Ambassador to Myanmar, at the 2018 UK-Japan Conference.

management needs, while establishing a system within the universities' marine science departments for the long-term monitoring of ecosystem health. This project is supported by the FFI-Woodside Energy Myanmar partnership (Flora and Fauna International, 2018).

Hydro-metrological changes

The Patheingyi Aero-Weather Bureau keeps records of temperature and rainfall in the township under the Department of Meteorology and Hydrology. Although there has not been a significant overall increase in the average temperature or rainfall, there has been a very significant change in rainfall patterns and many reported temperature spikes, which indicates the temperature is rising slowly. The highest temperature recorded this century was 40.1°C with the average now 37.7°C and the average low temperature 17.8°C.

Recent unusual rainfall events include, the monsoon arriving later in four of the past five years, droughts in 2012 and 2013, and a local tornado at the start of the monsoon season which destroyed houses and caused severe flooding in 2017. The changes in rainfall patterns is causing progressively more villages to be directly affected by drinking water shortages each year. This is supported by the current Water Supply Improvement Project in Patheingyi with the aim to address long term water shortages and elevate in the short term with temporary mobile water purifiers (Fiscal Year 2013 Water Supply Project Formation Program, 2014).

Using records from 1980 to the present it has been established that overall the rain is arriving later, it is raining heavier when it does rain, there is a reduced amount of days that it does rain, and there is a gap in the monsoon rainy season when the rain stops (Department of Meteorology and Hydrology, 2018). Heavy rain then resumes very late in the season and increasingly at the harvest period. It has been reported that it is getting more and more difficult to grow paddy, as sometimes it is raining during the cultivation period, there being no rain mid-monsoon season when paddy crops require rain, and there have been several crops lost when there was rain during the harvests.

Quotes from the focus group discussions include

"The rainfalls cannot reach the required water level; thus, water volume is less, therefore, the invasion of sea water is 21 days earlier last year³⁴".

"The invasion of sea water and the loss of freshwater can cause paddy field destruction".

"Last year, the sea water contamination destroyed the farms. Heavy rain also caused destruction and farming need to be started over".

Fishing

There were multiple cross verified accounts from the focus group discussion in the villages that climate change is having a severe impact on fishing, several rarer species³⁵ have disappeared completely, there is a reduced variety of fish species being caught, the fish farmed in ponds are showing signs of heat stress due to higher water temperatures. And the rise in temperature is leading to a drop in the PH level of the water in the fish ponds on a more regular basis, this is making fish production increasingly unviable due to reduced ability to cover costs and make a profit.

The reduced catch has led to unsustainable practices being used by locals and non-locals who continue to try and make a living from fishing, the unsustainable practices include using nets with smaller mesh to catch small fish and 'using bombing' (dynamite or similar) and putting drugs or poisons (cyanide) in

³⁴ This figure was confirmed in the presentation of preliminary findings and consultation with government agencies workshop held in Nay Pyi Taw on 10th April 2018.

³⁵ Exact species not named. A 2017 study advised three highly commercial species were endangered, the Hilsa Shad *Tenualosa ilisha*, Indian Threadfin *Polynemus indicus*, and the Four-finger Threadfin *Eleutheronema tetradactylum*, additionally two species of shark are critically endangered and two endangered (Leadbitter, 2017).

the water to stun the fish. All of these practices allow for fish of all sizes at all periods of the breeding cycle to be harvested, this is interfering in the breeding cycles and further reducing the catch each subsequent year. This is supported by current studies that advise the practices of overfishing, destructive fishing practices, reduced fish migration routes due to dams, mangrove deforestation, and increasing water pollution are now being exerted on fish stocks and the natural resources that support production in the Delta is resulting in concerns that current fish production, consumption and export earnings levels may become difficult to maintain in the near future (Vaughan, 2016).

There were also several reports, which were verified by groups discussing agricultural practices that there has been a significant increase in the use of fertilisers and pesticides due to the degraded soil and the increase in pest infestations, the run off from this is highly toxic to the fish and is causing the fish stocks to further decline.

Quotes from the focus group discussions include

“Although people generally use the term fish poisoning, the farmers called it the use of pesticides. Water becomes polluted by pesticide residues”.

“The use of fish poisoning and bombing in fishing caused undesired consequences, some people are suffered from diarrhoea because of that, it is not good in the long term”.

Paddy farming

There were multiple cross verified accounts from a wide range of focus group discussions held in two villages in Pathein township that rainfall patterns have altered significantly. Whilst the different villages were affected differently and therefore reported differently, the overall message was consistent and clear, the rainfall patterns are no longer predictable, have caused large crop losses and have caused several farmers to abandon growing certain crops that require predictable rain patterns. Other farmers have also changed the variety of rice grown, to suit the changing conditions, but the newer variety is lower yield and lower quality, the therefore difficult to sell, and if it is sold, it is sold at a lower price.

The altered rainfall pattern has also caused paddy crop losses due to reduced water flows during the growing season allowing salt water to intrude further upstream whilst paddy was still in the fields. In addition to the late arrival of rain delaying sowing, raining late in the growing cycle causing fungal disease outbreaks and pest infestations, and raining during harvest season preventing the drying of the grain and once again causing outbreaks of fungal diseases and pests. This causes blemishes on the crop, reducing its saleability, and if it can be sold the sale price is lower.

These conditions have led to the increased use of fertilisers to try and increase the yield, and a dramatic increase in the use of pesticides, to try and control the pest infestations. It was admitted there was little or no inherent knowledge or training in regard to the use of the agricultural chemical inputs, leading to their overuse ‘to make sure’ that it was effective. The run off from these practices is affecting the quality of the local drinking water supply, this and the fact that wells are increasingly running dry in the dry season is causing a range of practical and social problems. In 2014, 16 percent of surveyed residents in Pathein Townships advised the availability of drinking water had worsened in the last three years and 63 percent advised it had stayed more or less the same (UNDP, 2014). The run off from the use of pesticides is also contaminating local streams, causing fish stocks and fish catch to drop significantly.

Quotes from the focus group discussions include

“Temperature is getting higher and the snow³⁶ is falling down at night that can cause diseases in the paddy field, although it is snow in the morning, the weather is very hot in day time”.

³⁶ This is a local name given to night time precipitation, similar to heavy dew, it is written as it was stated.

“There is significant difference between night time and day time temperature, the snow³⁷ is falling down on the crops in winter that make holes on it when it gets sunlight”.

“The produce from Paw San rice and Tee Kate rice are 50 and 60 baskets respectively. Regular seeds of rice are usually grown these days and its production rate cannot be compared to that of good quality seeds such as, Seikda Thuka, Seik Pa Lat and Khine Shwe War paddy which are grown in the past”.

“The investment cost to have good harvest rate is increasing year after year”.

“When it is drought, people have to dig well for their plantation”.

“The production rate is expected to be decreasing if only the seed of Paw San Hway rice is grown every year”.

“The cost of inputs can be more than the price the crop is sold for”.

“Salt water sea-level is getting higher and there is early invasion of sea water at the time when the end of monsoon is not right”.

“The rainfalls cannot reach the required water level; thus, water volume is less, therefore, the invasion of sea water is 21 days earlier last year’.

“The invasion of sea water and the loss of freshwater can cause paddy field destruction”.

“Last year, the sea water contamination destroyed the farms. Heavy rain also caused destruction and farming need to be started over”.

Forest related activities

The mangrove areas of Pathein continue to suffer degradation and contribute to the overall reduction of mangroves and forestry in the delta zone³⁸. A number of studies and research into mangrove restoration have been undertaken by Pathein University and international donors and significant faith in the Forestry Department to undertake replanting and mangrove restoration in the future (Worldview International Foundation, 2015). Replanting of 10,000 mangrove trees with the permission of the Forestry Department occurred in 2014 (The Irrawaddy, 2018).

As trees are felled to produce charcoal for household use and for sale to supplement household income, there is no systematic replanting of these trees. There is also illegal felling and trading of wood and cutting of mangrove forests, for use as firewood.

Social changes

The social structure is altering as farming and fishing become less reliable and less viable, there were several reports of donations to monasteries and monastic should dropping significantly due to reduced family income and increasing reports of domestic violence due to the continual financial and work pressures. There are also reports of the younger generation, in some instances whole families seeking alternative employment elsewhere. Young unmarried males and increasingly male heads of households are moving to the cities to work in the construction sector, and young unmarried females to work in the textile factories. This is reducing the agricultural workforce available for peak periods of sowing and harvest, further reducing the agricultural outputs of the area, and disrupting the social fabric of family, community and village life to the point where many village residents see traditional village life as rapidly disappearing.

Whilst there appears to be a migration route to the city of Pathein, in addition to the city of Yangon and points further afield, which is keeping a large percentage closer to their home villages, the outward migration of younger males and females and younger male heads of households, is placing a

³⁷ Ibid

³⁸ The delta region contains less than 16 percent of mangrove coverage than it had in 1980 (MSWRR, 2013)

very great responsibility on those continuing to live in the village, the young, the elderly and females with children, many of whom are now effectively the heads of their households.

Currently there are number of garment factories in Patheingyi Township area providing job opportunities for up to 6,000 persons and plans have been announced to build approximately 50 more in the area (Myanmar Times, 2018a and Mizzima, 2018). Patheingyi is very well connected to other areas, there are vehicle road 56 routes in and out of the area, and numerous options for water transportation. This is situating Patheingyi well for future business based on trading and the tourist, hotel and travel sectors. This is likely to increase in the very near future and encourage more people to leave agricultural life.

In addition to increased general family responsibilities and increased responsibility for a larger and more diverse range of farm work, there has been a very large increase in small shops attached to houses, where females or school age children sell small household items in an attempt to supplement the family income, this further reduces the amount of time and focus that can be attributed to agricultural pursuits, keeps children out of school, and further erodes the social fabric of the villages. The increasing emphasis on the push for the tourism to Chaungtha Beach and Ngwe Hsaung Beach and the growth in small shops is encouraging futures in retail rather than agricultural (Khaing, 2013). There are also several reports that many of the small family shops are extending large amounts of credit to the agricultural workers, expecting to be paid at harvest time, with reduced harvest outputs, payment is by no means certain.

Quotes from the focus group discussions include

“Residents move to the big cities and towns including Patheingyi and Yangon for better job opportunities due to poor weather conditions, unprofitable fishing, and paddy here in the village”.

“There are many difficulties getting casual labour and it rained just before harvest time,”

“It is hard to find enough labourers especially in cultivation periods and at harvest”.

“All my children are working in cities and we depend on their income.”

Research Question 3

What types of disasters are occurring in the study area? (For a full historical list see Annex B)

As advised, climate change and disaster events are becoming increasingly interrelated, the mutually reinforcing relationship between climate change and disasters is growing stronger, and for all practical purposes are becoming inseparable (IPCC, 2007). The intensity of hydro-meteorological disaster events, such as storms, heavy rainfall events, floods and the associated landslides, are increased by climate change, and climate change is also the driver behind slow onset disasters such as droughts and the associated temperature spikes.

Myanmar’s National Adaptation Program of Action identifies the Ayeyarwaddy Delta as the most vulnerable region of Myanmar. Delta communities and their livelihoods strategies are exposed to a wide range of shocks and stresses. As a coastal region, climate is the most significant driver of adverse weather events, and the shifting and dynamic tidal cycle, is a major determinant of which areas paddy production is possible. Extreme coastal storm weather events are striking the region with increasing frequency and intensity, and freshwater flooding originating from upstream is occurring more frequently. Pest and disease outbreaks that impact human health, crops, and livestock are often induced or aggravated by unfavourable climate conditions and are becoming increasingly common during extended periods of humid and cloudy weather. The sea-level is predicted to rise 12 cm by 2020, this will increase the area exposed to salinity intrusion, storm surge, and groundwater salinity. Water temperatures in the Bay of Bengal are also expected to increase. As a consequence, coastal storms and extreme weather events are expected to occur with greater frequency and magnitude increasing flood exposure, surface and ground water salinity, and erosion. Increasing erratic weather conditions will increase the occurrence of unseasonable rainfall and extended dry spells. Extreme heat

spells are already beginning to occur with greater frequency and intensity, notably during the pre-monsoon months of March, April, and May. These are also expected to increase as a result of steady increases in average temperature (Vaughan, 2016).

Dry zone

- Flood and drought (increasingly in the same year)
- Water shortages for human, animal and agricultural use
- Mass dying of small farm animals due to extreme temperature spikes and heat stress related to the increased humidity.

Delta zone

- Salinity rising in the water table, due to foreshore erosion and reduced water flows in streams
- Flood and cyclone
- Fires (due to longer periods of heat and higher temperatures)
- Water shortages for human, animal and agricultural use
- Large crop disease outbreaks
- Mass dying of small farm animals due to extreme temperature spikes
- Large loss of fish stocks, and loss of fish diversity
- Salt water intrusion into paddy fields (due to insufficient rain to keep streams flowing)

Meiktila Township is experiencing temperature spikes to extreme levels, the temperature spikes have led to mass dying of small livestock such as chickens and goats due to heat stress.

In Meiktila, the average maximum temperature is around 33°C, 2010, was the second hottest within the last 30 years, when 247 days exceeded the average maximum temperature. Of these, 27 days recorded a temperature of ≥ 40 , the highest recorded temperature in the last 30 years was 44.20°C on 13th April 2010. Other very hot temperatures were 44°C on 14 May 2010, 43.50°C on 18 May 2010, and 43°C being recorded 4 times, on 25 April, 13 May, 15 May, and 17 May 2010 (Regional Integrated Multi-hazard Early Warning, 2016).

There has also been a change in rainfall patterns, including increasing quantity and severity of rainfall with no significant increase in the number of rainy days, this has caused increased flooding, soil erosion and crop losses due to being washed away, in the rainy season.

There have been four seasons in the past decade where the crop losses of soybean and sesame have effectively been 100 percent, and other years when the losses were significant due to newly sown crops being washed away by the heavy rain. The increase in rainfall and the associated soil erosion has also caused changes in surface water flows, this combined with the temperature spikes has led to shortages of drinking water in the dry season for community members, for agricultural use and for watering farm animals. The shortages are becoming so regular and severe that there is now a perceived obligation on community members who are not affected to donate water to community members who are.

While there were equal number of years over and above the annual average rainfall over the past 30 years, there have been 130 heavy rainfall events, of more ≥ 40 mm in 24 hours, and nine (9) rainfall events of more than 100mm in 24 hours. Based on the 30 years of records available, heavy rainfall events over Meiktila, show an increasing trend (Myanmar Environment Institute, 2017: Regional Integrated Multi-Hazard Early Warning, 2016).

Increases in humidity and the increase in the number of dull and cloudy days, which keeps the humidity level high for much longer periods have led to an increase in fungal based infections and diseases across the entire spectrum of the community. As always is the case, the young, the elderly and those not in robust health are the most vulnerable.

Community members have reported a dramatic increase in the rate, severity and difficulty in treating effectively breathing and skin infections in young children and the elderly. This is compounded by there being types of fungal infections not previously encountered, the early symptoms of which are not recognised, for which there is no traditional remedy, and for which there is no readily accessible medicine.

The increased humidity has also led to an increase in the number of outbreaks, severity of outbreaks, and difficulty in treating outbreaks of diseases and fungal type infections in farm animals. The most severe outcomes of this has been cross validated reports of mass dying of goats, and higher losses of chickens. The loss of chickens is compounded by very large losses due to regular and increasing heat spikes. The higher humidity has also led to an increase in agricultural fungal diseases, for which traditional farming practices has no remedy. In neighbouring dry zone areas impacted by the reduction of rainy days from 120 to 80 and as a consequence agricultural patterns and crop yields are affected. As a response to the changing rainfall pattern, farmers are changing their cropping patterns and cropping systems. In many upland fields, fruit trees (mango, plums), *Limonia acidissima* and gum tree (*Sterculia versicolor*) are planted and field crops are cultivated in a form of agroforestry (Bann, et al., 2017). In 2018 the Meiktila Township Disaster Management Plan was released by the Department of Relief and Resettlement in Myanmar language. The 2017 Meiktila Township Environmental Assessment by Myanmar Environment Institute and supported by BRACED consortium is supported by the Ministry for Natural Resources and Environmental Conservation also supports these findings.

Ngaputaw Township; Water shortages are becoming so common that there have been government programs to deliver water to the most affect villages, a freshwater lake that was a main water source has dried up for the first time in living memory. The shortages are becoming so regular and severe that there is now a perceived obligation on community members who are not affected to donate water to community members who are.

This supported by a recent study by Driel and Nauta (2014), who found that water scarcity has become a daily challenge in Myanmar's Ayeyarwady Delta in the dry season, especially in the Lower and Middle Delta. Thousands are still struggling after the damage to water sources caused by Cyclone Nargis in May, 2008. Since most villages do not have access to piped water and nearby tidal rivers are often saline, the delta's inhabitants traditionally source drinking water from rainwater harvesting, communal water ponds and tube and open wells. The ponds help villagers during the dry season, which stretches from November to May, but can be insufficient. Many ponds and wells were heavily salinized when the tidal surge inundated much of the low-lying area when cyclone Nargis struck the lower delta (Driel and Nauta, 2014).

There has also been a change in rainfall patterns, including increasing quantity and severity of rainfall this has caused increased and severity of flooding, and soil erosion in the villages on the sides of the range to north of the township, and crop losses due to being washed away, in the rainy season.

There has been a very significant increase in the number of outbreaks, severity of outbreaks, and difficulty in treating outbreaks of diseases and fungal type agricultural diseases for which traditional farming practices has no remedy. There have also been reports of mass dying of goats, and higher losses of chickens. The loss of chickens is compounded by very large losses due to regular and increasing heat spikes. These comments are supported by a study by Lian and Bhullar, (2010) who found that the effects of increasing temperatures and erratic precipitation patterns are the spread of infectious diseases, heat stress, heat exhaustion and dehydration.

The Ayeyarwady Baseline Survey Report (2016) identified a township disaster risk reduction plan was devised in 2008, that is designed cover emergency response, early warning and community-based disaster risk management activities. There are 15 cyclone shelters in the township, but no information was available on food or water stockpiles, or materials for responding to disaster events (Newell, 2017).

Pathein Township is experiencing similar issues and problems to Ngaputaw Township, which is to be expected due to their proximity. This includes temperature spikes to extreme levels, leading to large losses of small livestock such as chickens and goats, significant changes in rainfall patterns, including increasing quantity and severity of rainfall this has caused increased and severity of flooding, and soil erosion in the villages on the sides of the range to north of the township, and crop losses due to being washed away, in the rainy season. Pathein is experiencing greater salt water intrusion up stream leading to large paddy crop losses.

Water shortages are also becoming so common that there have been government programs to deliver water to the most affect villages, and a dedicated program to drill wells in villages and monasteries. The shortages are becoming so regular and severe that there is now a perceived obligation on community members who are not affected to donate water to community members who are affected.

There has been a very significant increase in the number of outbreaks, severity of outbreaks, and difficulty in treating outbreaks of diseases and fungal type agricultural diseases for which traditional farming practices has no remedy. There have also been reports of mass dying of goats, and higher losses of chickens. The loss of chickens is compounded by very large losses due to regular and increasing heat spikes. These statements are supported by the findings of Lian and Bhullar, (2010) and Driel and Nauta, (2014) whose assessments and related findings were for the whole of the delta region.

Research Question 4

How are climate change and disaster events effect livelihood activities, resources and materials in the study area?

The adverse impacts of climate change increase the vulnerability and reduces the adaptive capacity of individuals and communities to disasters, and the level of impact on the adaptive capacity and vulnerability of individuals, groups and communities is directly correlated to their level of poverty, and socio-economic status. Disasters therefore have a greater impact on the livelihoods and the ecosystems on which many livelihoods depend of those living in poverty and of low socio-economic status (UNISDR, 2011).

Dry zone

- Lower crop production
- Increased use of fertilizer and pesticide (higher inputs)
- Lower price of crop product due to blemishes (caused by changes in rainfall patterns)
- Increase in animal illness seasonally
- Increase in soil erosion
- Increase outward migration

Delta zone

- Lower crop production
- Increased soil salinity
- Increased salt water intrusion up stream

- Increased use of fertilizer and pesticide (higher inputs)
- Lower price of crop product due to blemishes (caused by changes in rainfall patterns)
- Increase in animal illness seasonally
- Increase in soil erosion
- Increase outward migration

Direct impacts (agriculture)

- Drought severely affecting agricultural activities
- Floods severely affecting crop yield
- Reduced intercropping due to unpredictable rainfall
- Less agricultural land due to soil erosion
- Increased salinity of soil
- Increased use of chemical fertilizer
- Increased use and greater variety of pesticides
- Overall less income from agricultural activities

Direct impact (livestock)

- Water scarcity for drinking and for cooling animals (less surface water, no mud bath wallowing for pigs and cows)
- All agricultural animals are more prone to sickness more often and more severely due to temperature spikes
- High rates of loss of goats in periods of high rainfall
- Higher rates of poultry infection due to the higher humidity
- Extreme rates of loss of poultry in extreme heat spikes
- High rates of respiratory diseases in pigs

Indirect impact agriculture and crops

- Crop production decline = Insufficient income
- Agriculture mechanisation (positive and negative effects)
- High migration numbers, almost every household now has at least one family member who has migrated
- Less 'On Farm' opportunities and development because of the loss of the youngest and brightest from the community
- Labour shortage during agricultural season 'peak periods of sowing and harvest' because of external migration
- Further reduction in crop output and income is predicted for the future

Indirect sociological impacts and changes

- Traditional cultural practices that are aligned to agricultural events are under threat
- Loss of first level of social support for the disadvantaged due to outward migration, this is provided by a higher ratio of productive capable individuals

- Lower income is leading to less ability to donate and support to monastic institutions and monastic schools, leading to an erosion of the second level of social support in the community for the most vulnerable and disadvantaged

Summary

Climate change and disaster events in the study areas are reducing the viability of traditional agricultural practices and crops, making it increasingly difficult to generate sufficient funds from farming to provide for the needs of all family members (Kyi, 2016; Htway, Phyo and Grunbuhel, 2015). This is exacerbated by the cost of living increasing due to Myanmar changing rapidly, and such things as mobile phones, internet use, motorised transport, and the general tendency to purchase and use a wider and greater variety of manufactured goods, such as clothing, cooking and eating utensils, building materials and agricultural inputs becoming normal in the lives of all community members³⁹.

Research Question 5

Research question five and six for the enhancing resilient livelihoods to address the climate change, disaster and poverty nexus in Myanmar will be addressed from two perspectives. Reporting upward from the village level as described to the research team in the village level consultations, and downward from the Government of Myanmar policy, strategy and program implementation.

What government interventions to address climate change, disaster and poverty are occurring in the study area? (Annex C to F lists the Government of Myanmar policy, strategy and program implementation and tools)

Poverty reduction

- Community driven development.
- Community led development planning.
- Saving and loan programs for crop production, livestock, and other agricultural costs.

Environmental conservation/protection

- Forest conservation, community forest projects, replanting fire wood forests, sustainable commercial forestry.
- Awareness raising related to forest conservation and replanting.
- Rural Development Department is drilling deeper drinking water wells.
- Department of Meteorology and Hydrology is providing training to the public in receiving understanding and acting on regular weather reports.

Disaster risk reduction and management

- Township disaster management committees are being established.
- Disaster Risk Reduction activities raising by government departments and the NGO sector.
- Construction of cyclone shelters by the government.
- Construction of safe areas for animals in floods (high ground).

³⁹ This particularly impacts the 'transition poor' who are designated to remain in poverty (World Bank Group, 2016b)

Reported by villagers within Ngaputaw Township

- Knowledge sharing and awareness training are being organized and delivered to the villagers and fishermen twice a month by government agencies.
- The news about impending disasters such as approaching storms is being sent from the regional government office to villagers via mobile phone.
- Information flow is getting more convenient and efficient with people already receiving weather reports. The local weather bureau also informs township administrators and the sub-townships regarding the forecast of storms using 'Viber apps'.
- Due to climate change, the veterinary department (VDMC) conducts vaccination and census data collection of farm animal health.
- There has been construction of 'lifesaving hills' for animals in the at Nargis affected area.
- There are workshops that discuss the consequences of climate change on animals and shortages of food. Activities are mainly focused on imported animal species, prevention and control of infectious disease among animals, knowledge sharing of livestock breeding and safety of foods.
- Natural disaster management committee has been established in most communities.
- There is a plan in place that includes local administrators, police and army personnel the Red Cross relevant INGO's and the fire control station to work together to rescue and relocate people to cyclone shelters which have already been constructed.
- Children, the elderly, pregnant females, mothers with small children and women have been involved in simulation exercises for rescue in the event of a cyclone.

Reported by villagers within Meiktila Township

- Improvement in roads and transport has made escaping flood easier.
- Vaccination of domestic animals, by the VDMC to reduce the risk of infection and disease.
- Training is being providing on natural methods of disaster risk reduction.
- Awareness raising activities for the villagers on the benefits of receiving and acting on regular meteorological updates.
- Farmers are being trained to undertake preparations in accord with weather conditions to minimize the amount of destruction of agricultural land.
- Training and information sharing on weather friendly crops that can be used in place of the normal species of crop.
- The Department of Meteorology and Hydrology offers training on meteorological conditions to the public.

Reported by villagers within Pathein Township

- Training, knowledge sharing workshops and simulation exercises are conducted continuously to prepare the community for adverse events, these are funded by natural

disaster management committee, with financial support from the Union budget not from regional government budget.

- Regional government budget is allocated for 24 different departments, when township-level training is planned the relevant department advises potential participants.
- On the 15th and 30th of every month there is training delivered to administrators at village level in coordination with the general administrator.
- Trees are planted on sloping ground to increase the capacity of the area in storm, so that local people have their own way of preventing danger from natural disaster.
- Rural development department is working in conjunction with general administrative department, fire control station and other social welfare groups.
- There has been a natural disaster management committee established.
- Integrated farming is carried out in conjunction with agricultural, livestock breeding and veterinary departments.
- Breeding fish in the paddy fields.
- Breeding different farm animals more suitable.
- Integrated farming in villages where a minimum of three acres can be dedicated to the process.
- Education in using animal waste as natural fertilizers to reduce farm inputs.

In 2015, the Patheingyi Cyclone Scenario Planning workshop established an action plan, identifying key roles and responsibilities in the advent of a future cyclone (Shelter Cluster, 2015). The Ayeyarwady Baseline Survey Report (2016) identified disaster risk reduction plan in 12 village tracts, emergency response plans lead by Myanmar Red Cross Society in all village tracts and community-based disaster risk management activities in 12 village tracts.

Research Question 6

What are the effective natural resource management policies and laws in the study area? how and why are they effective? (Annex C to F lists the Government of Myanmar policy, strategy and program implementation and tools)

Legacies from the Past, Conflicts over Resources

Despite having an abundance of natural resources, Myanmar's citizens are among the poorest in Asia and lag behind their ASEAN neighbours in all aspects of human development. Myanmar's natural resources were managed in unsustainable and non-transparent ways during decades of military rule and economic mismanagement. Lack of transparency in the past has raised many questions about potential misappropriation. Revenues were used for state needs, among them being military expenses to ensure the military's control. While natural resources were being sold to neighbouring countries, the local population was left empty-handed.

Yet, citizens are well-aware of the large revenues being obtained from gas, gems, timber, and minerals sales and exports and want to see these clearly translate into revenues in the national budget, as well as to see consideration and planning for the management of the wealth of the country in a way that will take them on the pathway out of poverty.

Many of the deposits of natural resources are located in ethnic areas of the country where long-running ethnic conflicts have often generated war economies to sustain decades of armed resistance against the central government. Investment projects in these areas have a lot of potential for conflict and for harming the fragile processes toward peace. Many observers agree that the ongoing Kachin conflict is basically about competition for local resources. In all areas, benefit-sharing models with ethnic groups – and, more importantly, matters of project control and autonomy – remain unresolved, not agreed, and unsatisfactorily legislated. Such discussion items are central to the political discussions that ethnic groups hope become part of the much-desired peace processes.

Current unprecedented levels of investment in the natural resources sector will massively increase pressure on natural resources, communities, and the country's ability to manage developments in a responsible and sustainable manner. Due to the current weak regulatory framework, foreign investment has the potential to add significant extra pressure to a system already under immense strain (Bauer, Kirk and Sahla, 2018).

Reported by villagers within Ngaputaw Township

- The policies are in place but not practiced on the ground. There is a land use policy but there is no natural resource management policy. Moreover, the township level government departments are not aware of their own department policy at the national level.
- There is inter-departmental collaboration between agriculture and integrated farming, such as fish breeding in the paddy fields.
- People from the Fishery Department attend natural environmental conservation workshops and technical knowledge is being provided.
- Agriculture, farming and irrigation department has developed a policy for fish breeding and conservation of natural resources.
- Other activities such as area monitoring, delivering of awareness training and notification of illegal fishing and fish poisoning are being undertaken.

Reported by villagers within Meiktila Township

- Rural Development Department helped the villagers to expand the lake located near the village and water was supplied to the village by means of motor pump, a well was dug at a village monastery, and for general water supply, tube wells are being drilled.
- Government institutions are informing people of the negative impacts of deforestation and encourage them not to fell trees for firewood, the Dry-Zone Greening Department shares responsibilities for growing more trees.
- Village residents are given alternative fuel stoves by means of a lucky draw.
- The Forest Department distributes seedlings and young plants to students and teachers to be grown in monasteries and schools.

Reported by villagers within Patheingyi Township

- Fishermen are gathered and training delivered whenever there is field visit to the village.
- Statements about awareness on fishing are announced through newspaper, television and radio channels.

- Fishery administration department provide fish fingerlings of different species, fish are farmed in the stream, natural water pond and flood water rings by each township under the instructions from the department, in June, July and August.
- There has been an attempt to return to breeding traditional fish species and research is being conducted to study the rehabilitation of fishing areas.
- People who farm fish in village ponds catch all the fishes and clean the ponds every year, but they are being taught to leave small fish in a separate part of the lake or pond to enhance reproduction of the fish during the following rainy season.

Research Question 7

Research question 7,8,9 and 10 for the enhancing resilient livelihoods to address the climate change, disaster and poverty nexus in Myanmar will be addressed from two perspectives. Reporting upward from the village level as described to the research team in the village level consultations, and downward from the programs, projects and interventions that have recently and are currently implemented by the INGO and NGO sector. The research cannot comment on the 'effectiveness' of these programs, as no independent analysis was undertaken.

What are the effective models for disaster risk reduction, climate change adaption and poverty alleviation in Myanmar? (Annex G provides planned, current and recently completed INGO and NGO projects and programs as per the MIMU datasets last updated 7 November 2017).

Disaster risk reduction

- Community Based Disaster Management (CBDRM by Disaster Management Training Centre with the Government and NGO contribution)
- Participatory Vulnerability Analysis (PVA) has been successful in a number of villages in the Patheingyi Township area⁴⁰
- Localization (strengthening the local organizations in disaster preparedness)

Development (poverty alleviation)

- Bottom-up approach (Planning), Village Development plan (Department of Rural Development)
- Disaster risk reduction (village and township level)
- Localization (strengthening the local organizations in disaster preparedness)
- Strengthening local Institutions and Community Based Organisations

Climate change adaption

- Implement Climate Risk Assessment
- Implement Climate Smart Agriculture
- Dissemination of the existing national policy related to the study should be mainstream into Ministry and Department policies and mechanisms for implementation and monitoring.

⁴⁰ ActionAid provided the case study of That Yat Wun Pu village in Patheingyi who through the PVA processes which identified the need to plant wind breaker trees, renovate the village well and fence the primary school to reduce their disaster losses. The key priority was the repair of the village bridge which upon completion provided disaster resilience but also improved access to markets, schools and the travel for the elderly (ActionAid, 2016).

Research Question 8

Are there any effective community-based disaster risk management, community-based adaption, poverty reduction, sustainable livelihood or other applicable interventions for strengthening the resilience of agricultural/rural livelihoods against climate change and disasters operating in the study area?

Several projects related to disaster resilience, climate change adaptation and livelihood projects have been carried out in the study area (BRACED funded by DFID, Ready for Anything and Aidmatch project funded by DFID), local rights program, several government initiatives, and community driven development for micro loan finance. There are also several some pilot projects on livelihoods by different development agencies, and a range of community awareness programs on disaster risk reduction and sustainable agriculture happening in the study areas. Assessments and evaluations of projects and programs are predominately unavailable for public release and require longitudinal data and collection to assess effectiveness. There are some exceptions including the LIFT consortium which endeavours to provide rapid assessments, collective assessments across funded programs and projects and transparency of results.

The Government of Myanmar across the various Ministries demonstrates an ongoing willingness to engage at all levels and with all organisations from the United Nations level to small local NGOs, to implement strategies, plans, programs, activities and importantly undertake collaborative development in all sectors and openly discuss the Government National planning directives. The Ministries are also developing tools, directions and plans for communities to strengthen resilience, such as the National Training on Mainstreaming Disaster and Climate Risk Management into Development Planning in Myanmar (MSWRR, 2014). Whilst the delivery of this has occurred in many of the larger regional centres, including Meiktila and Patheingyi, it would appear there is far more awareness of the disaster risk reduction training provided by various INGOs and local partners based on internal organisational material is more well known. Taking in account the INGO training is current and based on the village tract level, it can be ascertained a disconnect exists between the Government of Myanmar level, the community level and the INGO focus.

Research Question 9

Are there any models of operation that could be consolidated to be more effective in Myanmar in the current circumstances?

Based on information from key informant interviews and the current situation, a simultaneous bottom up and top down approach should be implemented. The community members are not familiar with bottom up approaches to development and lack the analytic thinking and capacity to practise a pure community-based approach.

Development (poverty alleviation)

- Bottom up approach (planning), Village Development Plan (Department of Rural Development)
- Disaster risk reduction (village and township level)
- Localization (strengthening the local organizations in disaster preparedness)
- Strengthening local Institutions and Community Based Organisations⁴¹

⁴¹ A 2017 ActionAid analysis of rural inequalities recommends the development of capacity at community level to self-organise to utilize information and technology to diversify agricultural livelihoods as well as taking collective action to address threats and risks building stronger cooperative mechanisms to increase resilience (Griffith, 2017).

Climate change

- Implement Climate Risk Assessment
- Implement Climate Smart Agriculture
- Dissemination of the existing National Policy related to the study should be mainstream into different government Ministry and Department policies and appropriate mechanism to follow up implementation and monitoring.

The 2015 Roadmap for Risk Assessment (Department of Relief and Resettlement, 2015) in partnership with UNICEF, clearly identifies the need to bring together the community/village level, NGOs and Government of Myanmar to address the poverty vulnerabilities that are the nexus to addressing disaster risk and climate change risk. As the Government of Myanmar has clearly identified the overriding priority to address poverty extends to all other priority policies (Union of the Republic of Myanmar, 2012), the opportunity exists to align effective models with policy and strategy.

Research Question 10

Are there any models of operation that should be considered for implementation at the national level in Myanmar?

The research did not identify any for the following reasons;

The research clearly established that although the language and terminology varied, the nexus between climate change, disaster and poverty was acknowledged by senior levels of government in Myanmar and was clearly articulated in a range of strategy and policy documents composed by the Government of Myanmar (Union of the Republic of Myanmar, 2012; MoNREC, 2017; MSWRR, 2017). The documents are intended to guide program design and implementation by the relevant government departments, International Non-Government Organisations and Myanmar Non-Government Organisations.

The research also clearly established that the nexus was known and accepted as requiring attention by government officers responsible for program management at the township level, was known and accepted as requiring attention by program managers at the township and village in the INGO and NGO sectors and was known and experienced by those involved in the research study at the village level.

The nexus was well known and from the approximately 80 Government, INGO and NGO program managers (Annex H) at the consultation workshop and there was consensus on all aspects of the nexus required attention. The research could not identify any programs currently on the ground in the study area that were designed to address the nexus at the township or village level. The workshop attendees were unable to clearly articulate how any current programs could be adapted to address the nexus.

Across all organisations it would indicate, insufficient emphasis has been given to turning the strategic and policy documents which have been in place for two to four years into township and village level programs both Government and INGO level. And that there has been insufficient training delivered to township and village level program managers on how to make minor but potentially significant adaptations to program design to address the nexus more effectively. Programs often address the funding requirement or specialisation of the organisation, such as improving nutrition without consideration to the climate change aspects that use of pesticides or herbicides to improve yield may impact on downstream fishing livelihoods.

Findings from the research related to the climate change, disaster and poverty nexus

- Myanmar finds itself as the new frontier to world players, as it welcomes, nurtures and promotes growth, development and expansion, the competing priorities of poverty alleviation, disaster risk reduction and climate change management are converging with the eyes of the world watching. The relatively inexperienced government of the National League for Democracy faces the additional task of establishing national security to gain and retain foreign investment and development whilst engaging internal ethnic armed conflict groups in political dialogue bringing the dimension of stable peace to the nexus (PWC, 2017). The attention of the world not only brings scrutiny, criticism and pressure but also brings opportunity, experience and funds. In a relatively short period, the Government of Myanmar has with determination and focus established a plethora of legislation, policy, strategies, plans, structures, procedures and departments to address the needs of the country in a methodical and logical sequence, and these are all available as open source documents.
- It is clear that across all levels of development, the current Government of Myanmar has been highly cooperative and welcoming of high level international assistance. Almost all Ministries, Departments and official publications are in joint cooperation with well-known and respected international organisations. Including the various United Nations agencies, the Asian Development Bank, the World Bank and many similar international delegations are providing assistance, guidance, expertise, input and analysis. The benefit is twofold, as best practice is implemented; mistakes are not duplicated and knowledge and learning are gained for administrators previously sheltered from external inputs. The downside is the need to manage the competing priorities of the country with the many views, opinions and agendas of the partners. Once the dialogue moves from the National level to the Regional and then the village and community, the complexity intensifies, as smaller partners, INGOS, NGOS and CSOs now seek to provide guidance and support but also to align and increase their internal agenda.
- Aware of the increasing need to guide (and at times dictate) development and ensure the nexus is addressed the Government of Myanmar is now seeking to heavily influence policy and program delivery, to try and address long term needs, with short term funding. The 2018 Development Assistance Policy (Development Assistance Coordination Unit, 2018) and subsequent requirements will be supported by the *Companies Law Act 2017* to direct development and guide INGOS to the nexus and other priority areas including peace. Only time will demonstrate the success of the Government of Myanmar to direct development and if the course will follow the Government of the Socialist Republic of Vietnam doi moi direction⁴² or a more unrestricted and unregulated approach as in much of Asia (Asian Development Bank, 2011).
- Currently the opportunity to align Government of Myanmar direction and engagement of the nexus in development programs with INGOS and NGOs is available. As most international donor funding cycles are three years, those programs and projects that commenced in 2014 and 2015 with the change of Government and opening of Myanmar to the world, are due for renewal or new and improved projects are to be proposed. The number of strategically relevant and highly influential policies are available for comment and /or in draft for feedback. The 2018 MoNREC National REDD+ Strategy for Myanmar is in draft awaiting comment and available as an open source document. The 2017 MoNREC Myanmar Climate Change Strategy and Action Plan 2016-2030 is also in final draft. Both strategies identify the Sustainable Development Goals and poverty alleviation as drivers and impacts on climate change. The

⁴² The 1986 doi moi reforms of economic adjustment to encourage globalisation through capitalism, international trade and foreign investment impact INGOS by upholding a strict legal framework that regulates the activities of INGOS (Bosold, 2013).

2017 MSWRR National Framework for Community Disaster Resilience identifies the need for harmonisation with the township level and linkages between INGOs/NGOs, communities/villages and National direction.

- A responsibility lies with organisations of all types and at all levels to interpret how to implement the existing national level strategies and policies related to addressing the nexus. The responsibility should be streamed into different government township level documentation and staff training with an appropriate mechanism to follow up implementation with monitoring and within organisations. Inclusion, compromise and understanding across disciplines and areas of expertise are necessary to ensure the synergy and drive to address the nexus.

The findings at the township and village level demonstrate the immediate requirement to act;

- The level of impact of climate change and disaster events on the adaptive capacity and vulnerability of individuals, groups and communities is directly correlated to their level of poverty, and socio-economic status.
- The adverse impacts of climate change and disaster events increase the vulnerability of individuals and communities in a direct correlation to their level of poverty, therefore;
- People living in poverty are impacted more severely by disasters and climate change events, and have a lower ability to recover
- People living in poverty are affected by disaster events to a greater extent for longer periods
- People living in poverty are affected over a wider spectrum of factors by climate change and disasters events including income generation, health, education, employment and livelihoods
- People living in poverty have a very limited ability to make life-style, livelihood, housing or employment changes to reduce future impact of climate change and disaster events
- People living in poverty have very limited ability to advocate effectively with those in decision making roles for changes to protect their families and communities from climate change and disaster events
- People living in poverty are most severely impacted by others from outside their area seeking to supplement their living in the areas traditionally only used by local residents due to climate change and disaster events forcing temporary or permanent relocation, such as fishing in streams and rivers, and use of natural recourses
- The overall net income in agricultural communities is dropping causing a lower a capacity to support the monastic system in Myanmar, which has traditionally relied on donations to operate schools and care for the disadvantaged and most vulnerable
- More females are killed and more females suffer a greater range of significant injuries in disaster events
- Females are more likely to have additional family income generation responsibilities, such as running a shop, or weaving placed upon them as farm income drops due to climate change and disaster events
- Females are more vulnerable than males to exploitation if they are forced to migrate to other areas for employment opportunities due to climate change and disaster events
- Females are more adversely affected by outward migration due to climate change and disaster events if they remain in the community, their range of responsibilities increases, they are increasingly becoming the de-facto head of the households, in addition to being the primary (often only adult) carer of children, being the carer for the elderly and infirm, in addition to being responsible for the farm management and labouring on the farm

Recommendations based on the findings from the research

- All organisations of all levels should engage with the relevant government ministry and department on how to align proposed programs and interventions with the existing national level strategies and policies related to addressing the nexus.
- The responsibility for addressing the nexus should also be streamed into government township level documentation, and this documentation should be consulted on a regular basis prior to and through the span of future programs. The INGO sector can assist in this area.
- Staff training with an appropriate mechanism to follow up implementation with monitoring and within organisations themselves needs to be designed and implemented in government departments, and within INGOs and NGOs.
- Inclusion, compromise and understanding across disciplines and areas of expertise, and thematic areas are necessary to ensure the synergy and drive to address the nexus.
- Identification, protection policies if possible, and strategies for replacement of key assets of poor and vulnerable individuals and groups, if these are damaged or lost in a disaster event need to be implemented.
- Increased use of chemical fertilizer and pesticides is an almost inevitable consequence of the agriculture sector in Myanmar 'modernising', education is urgently required to ensure sustainability and reduce environmental damage
- Education and means to change of crop variety, species or type to increase yield and/or substitute with different crops that are more applicable to the situation and circumstances is urgently required
- Education on ways to invest the money from remittances of migrant workers in agriculture mechanisation and livestock sectors is required to prevent 'pathway migration', this being those initially left behind leaving to join and then becoming dependant on those now living in urban areas
- Education and training on diversification of income production, small shops, weaving, sustainable use of forest products, sustainable charcoal production (from plantation forest) and many other similar strategies are required to reduce further outward migration from rural areas
- Education and assistance to introduce 'value added' processing of agricultural products at source, to develop secondary employment opportunities and increase income in the villages for example processing of raw crops into 'bespoke'⁴³ processed packaged products, processing of timber logs into finished products; dressed and dried timber; furniture; wood carvings
- Emerging from an inwardly focused past, Myanmar has commenced the process of reform and rebuilding and expanding the knowledge, skills and educational standards of the population. As schooling systems in Myanmar reach all geographic areas and ethnic communities, the ability to reach and provide knowledge to adults through the children regarding the nexus components and the nexus itself is the most extensive and expansive mechanism available, programs that make suitable information available at this level should be considered by the INGO sector

⁴³ This has been very successful in Vietnam and Cambodia

- The Ministry of Education and the Ministry of Social Welfare, Relief and Resettlement have already commenced the process of education on the Guidance of Mainstreaming Disaster Risk Reduction in the Education Sector and is working with UNICEF, UNESCO, the Myanmar Red Cross Society and many other INGOs and CSOs. This provides a blueprint for all sectors to support the Ministry in achieving educational improvements and integrating the nexus of informed judgement, critical thinking and decisive action to the emerging generation
- As the Ministry of Education develops and standardises the curriculum across all levels and types of education facilities the inclusion of education on climate change, education on alternative employment and the associated poverty alleviation practices and food security are the single greatest opportunity and should be viewed as essential
- The Monastic education system is undergoing transformation, is moving from religion orientated instruction to mainstream education and is seeking to establish standards and improve quality, leading to organisational bodies such as the Monastic Education Group being formed. As the Monastic education system moves towards adopting the Union curriculum it is seeking support and assistance, and an opportunity exists to introduce climate change, disaster awareness and poverty alleviation education into the monastic system
- An opportunity exists to introduce climate change, disaster awareness and poverty alleviation strategies into mainstream agricultural education, due to the concentration of tertiary level agriculture education being at a single institution, the Yenzin Agricultural University. A concentrated and consistent curriculum component to educate future decision makers, business leaders and agricultural advisers, should be considered an opportunity
- There are a wide range of opportunities supporting and encouraging the engagement of the private sector and instilling corporate social responsibility, climate sensitive, disaster mitigation and poverty alleviation due to the Government introduction of the *Myanmar Companies Act 2017* and *Myanmar National Building Code 2016*, with the associated guidelines for urban and rural planning, these should be explored by the INGO sector
- Since 2012, the expansion and development of a social protection system to ensure universal health coverage and education equity, has seen a range of partnerships between government and non-government actors which prioritise the poor and vulnerable. There are a range of opportunities for social protection programs to improve resilience to natural disasters and build productive assets in local communities that enables households to invest in health and education, access better jobs and make productive investments, these should be explored
- Poverty reduction and inclusive growth drive macro-economic policies and provide focus to sectors and relevant Ministries in the formulation of policies, plans and frameworks. Myanmar remains committed to the 230 indicators of the Sustainable Development Goals. Not only are Ministries responsible for goal achievement but the 15-year time limit to 2030 provides urgency and emphasis for essential management to balance the three dimensions of sustainable development, economic reform and expansion, and sustainable social and environmental development. This provides a wealth of opportunities for the INGO sector to engage and work towards addressing the nexus
- The Ministry of Natural Resources and Environmental Conservation (MoNREC) in 2017 produced six policy guidance briefs on addressing and adapting to climate change for all sectors of society with a focus on food security and ecology. The Myanmar Climate Change Strategy and Action Plan 2016-2030 is currently in final draft with the MoNREC. This plan provides the vision for achieving climate resilient, low-carbon, resource efficient and inclusive development as a contribution to sustainable development. To support this vision, Myanmar is also developing its Green Economy Strategic Framework. All INGOs should input into the final versions of these documents and work to influence the final output

- Myanmar is committed to engaging the private sector in long term environmental and climate change issues and tangible business cases. This commitment proactively implements environmental regulations around the industrial location suitability and protection of land and water, solid and liquid waste management and other related issues. The Myanmar government also currently has draft policies on renewable energy and the role of public and private partnerships, which will be completed soon. The current policies and strategies provide a basis for engagement by the INGO sector and a rationale to do so, this is an opportunity for the INGO sector that should not be allowed to pass by.

Annexes

Annex A. Historical significant natural disasters

Table 6 illustrates a history of the most significant natural disasters of this century and the accompanying vulnerability consequences⁴⁴.

| Time | Occurrence | Locations | Impact |
|--------------|---|---|--|
| July 2017 | Floods and Landslides | Magway, Sagaing, Ayeyarwady, Bago, Mandalay | 214,000 displaced persons, eight deaths, assessments of damage ongoing |
| May 2017 | Cyclone Mora | Rakhine | Numbers unconfirmed estimated 50,000 structures, 26,000 sanitations. Situation exacerbated due to IDP camps and Cox's Bazar the predominate landfall location. |
| August 2016 | Monsoon Floods | Magway, Sagaing, Kachin, Yangon, Chi, Rakhine | 377,000 displaced persons, five deaths, schools closed, flood waters Ayeyarwady Delta and heavy rainfall Andaman Sea and Bay of Bengal |
| July 2016 | Myanmar Floods | Rakhine, Sagaing, Kachin, Mandalay, Magway, Chin | 39,306 displaced persons, logistical challenges due to limited road access and flood rivers |
| June 2016 | Monsoon Tropical Cyclone Roanu | Sagaing, Rakhine, Ayeyarwady, Bago, Chin | 27,757 displaced persons, 14 deaths, 5,931 houses submerged or damaged |
| 2015-2016 | South East Asian Drought | Myanmar | 446 villages suffered water shortages in summer 2015 or 2016. Since mid-February 2016 experiencing severe impact of El Nino including extreme temperatures, unusual rainfall patterns, dry soil, high risk of fires and acute water shortages |
| July 2015 | Floods & Landslides with Tropical Cyclone Komen | Ayeyarwady, Shan, Bago, Chin, Kachin, Kayin, Magway, Yangon, Mandalay, Mon, Rakhine, Sagaing, | 1.7 million displaced persons, 125 deaths. On 31 July, Myanmar's President declared Chin and Rakhine states and the regions of Sagaing and Magway, to be natural disaster zones 525, 330 ha of farmland inundated, 250,000 animals lost, 30,000 ha of fish and shrimp affected |
| July 2014 | Myanmar Floods | Ayeyarwady, Bago, Kachin, Shan, Magway, Rakhine, Yangon, Tanintharyi | 36,000 displaced persons. Authorities provided emergency assistance such as food rations and non-food items, and WFP sent an assessment team |
| August 2013 | Myanmar Floods | Kayin, Mon, Rakhine, Tanintharyi, Ayeyarwady | 145,300 displaced persons, eight deaths, one missing, 33 relief camps, extensive flooding and damage |
| Nov 2012 | 6.8 Earthquake | Northern Myanmar | 16 deaths, 52 injuries, 400 houses, 65 schools and 100 religious buildings damaged |
| August 2012 | Myanmar Floods | Myanmar | 86,000 displaced persons, 287,000 impacted persons, over 136,000 acres of land damaged |
| October 2011 | Magway Floods | Magway | 30,000 impacted persons, 3,500 houses and 5,400 acres of cropland destroyed |

⁴⁴ Derived from sources Centre of Excellence in Disaster Management and Humanitarian Assistance, Reliefweb, OCHA and International Federation of Red Cross.

| Time | Occurrence | Locations | Impact |
|--------------|----------------------|---------------------------------------|--|
| March 2011 | 6.8 Earthquake | Shan | 18,000 impacted persons, 74 deaths, 125 injured. 3,000 persons became homeless |
| October 2010 | Cyclone Giri | Rakhine and Central | 700,000 displaced persons, 45 deaths |
| May 2008 | Cyclone Nargis | Ayeyarwaddy, Bago, Yangon, Mon, Kayin | 3.2 impacted persons, 138,373 deaths, USD 4.1 billion in damage, salt-water intrusion into agricultural lands and freshwater sources causing economic, social and environmental damage |
| 2006 | Cyclone Mala | Rakhine, Ayeyarwaddy | 37 deaths, USD 430,000 in damage |
| 2004 | Indian Ocean Tsunami | Ayeyarwaddy | 61 deaths |
| 2003 | Earthquake | Taungdwingyi | 7 deaths |

Table 11 Significant natural disasters and vulnerability consequences

Annex B: Myanmar Climate Change Priorities

| Sector/Theme | Priority Adaptation Project Title | USD |
|--|---|-------------------------|
| FIRST PRIORITY LEVEL SECTORS: Agriculture, Early Warning Systems and Forest | | |
| AGRICULTURE | First priority: Reduced climate change vulnerability of rural and subsistence farmers through locally relevant technologies, climate-resilient rice varieties, and ex/in-situ conservation of plant genetic resources. | USD 1.5 |
| | Second priority: Increased climate change resilience of rural and subsistence farmers in the Dry and Hilly Zones through legume crop diversification and climate-resilient varieties. | USD 1.5 |
| | Third priority: Increasing the climate change resilience of Dry Zone communities by diversifying and intensifying home-gardens through solar-power technology, high-income fruit crops and climate-smart agriculture approaches. | USD 1.5 |
| | Fourth priority: Reducing the vulnerability of livelihoods in agro-ecological zones to climate change through the transfer of a wide range of high-yielding and climate-resilient rice varieties. | USD 1.5 |
| EARLY WARNING SYSTEMS | First priority: Improving weather observation capacity through a mobile/deployable weather radar system for providing early warning systems against extreme weather events. | USD 3 |
| | Second priority: Developing a flood early warning system for reducing the vulnerability of local communities to climate change impacts. | USD 1 |
| | Third priority: Assessing the hydrological impact of climate change on river systems. | USD 1.5 |
| | Fourth priority: Developing a drought early warning system for reducing the vulnerability of local communities to climate change impacts. | USD 1.5 |
| FOREST | First priority: Building the resilience of degraded/sensitive forest areas to climate change impacts through reforestation. | USD 3.5 |
| | Second priority: Community-based reforestation for climate-resilient ecosystems and rural livelihoods in degraded watershed areas of the Central Dry Zone. | USD 2.5 |
| | Third priority: Community-based mangrove restoration for climate-resilient ecosystems and rural livelihoods in vulnerable and degraded coastal regions. | USD 2.5 |
| | Fourth priority: Enhancing the climate change resilience of rural livelihoods through community-based restoration at the Indawgyi and Inle Lake watershed areas in the Northern Hilly Region. | USD 2.5 |
| SECOND PRIORITY LEVEL SECTORS: Public Health and Water Resources | | |
| PUBLIC HEALTH | First priority: Adaptation to climate change through climate-resilient health facilities in the Rakhine State and Ayeyarwady Region. | USD 0.2 / health centre |
| | Second priority: Integrating climate change adaptation strategies into the prevention of heat-related disorders in agricultural and industrial workers. | USD 1.5 |
| | Third priority: Supporting Intensive Care Units in hospitals to treat heart related disorders. | USD 1 |
| | Fourth priority: Reducing the vulnerability of local communities to climate induced water-related health hazards through the provision of safe water supplies and sanitary latrines. | USD 1.5 |
| WATER RESOURCES | First priority: Assessing the status of dams for providing sustainable water supplies and withstanding flood risks under future climate change. | USD 1.5 |

| | | |
|--|--|----------|
| | Second priority: Constructing small-scale water impoundments in Nay Pyi Taw for flood control and increasing water supplies for local communities. | USD 3.56 |
| | Third priority: Protecting human life and property against climate extremes in the Ayeyarwady river system through channel improvement and adaptation structures. | USD 0.6 |
| | Fourth priority: Estimating regional rainfall-runoff relationships for supporting the development of flood early warning systems and ensuring sustainable water management. | USD 1 |
| THIRD PRIORITY LEVEL SECTOR: Coastal Zone | | |
| COASTAL ZONE | First priority: Adaptation to climate change through Integrated Coastal Zone Management. | USD 0.8 |
| | Second priority: Community-based mangrove reforestation for building climate- | USD 3 |

Table 12 Climate Change Priorities

Annex C: Case study one.

Seventy motorized water pumps were distributed to farmers at a ceremony held in Shwebo Township. The pumps will help improve access and availability of water for irrigation to close to 3000 people and irrigate more than 2900 acres of land used to grow rice, pulses, sugar cane, eggplant, tomato and onion.

The water pumps were handed over to farmers' groups which will ensure its proper management and operation for long-term sustainability. They were made available through the Addressing Climate Change Risks on Water Resources and Food Security in the Dry Zone of Myanmar" project which is funded through the Adaptation Fund and implemented by the United Nations Development Programme in partnership with the Ministry of Environmental Conservation and Forestry.

U Myint Thein, one of the beneficiaries from Hin Tha Gyi village said that he will be able to double onion production in the coming season now that water will be available during the dry season.

The handover ceremony was attended by Honourable U Moe Kyaw Thu, Regional Parliament Member of Sagaing, U Maung Htoo, Director of General Administration Department of Shwebo District and Chairman of District General Management Committee, and representatives of relevant departments of Shwebo District and Township.

"I am happy to see that most of the beneficiaries are from the eastern part of Shwebo, where water is scarce," said U Win Myat Thein, Assistant Director of the Department of Rural Development.

"Drought and water scarcity are the dominant climate-related hazards in Myanmar's Dry Zone, making it the most food insecure region in the country. UNDP is pleased to assist communities in addressing these concerns which constitute a constant threat to the livelihoods of the rural poor," said Dawn Del Rio, UNDP Deputy Country Director.

The "Addressing Climate Change Risks on Water Resources and Food Security in the Dry Zone of Myanmar" project aims to benefit more than 250,000 people living in five townships - Shwebo and Monywa in Sagaing Region, Myingyan and Nyaung Oo in Mandalay Region, and Chauk in Magway Region. The project started in 2015 and will conclude in 2019.

Source: UNITED NATIONS DEVELOPMENT PROGRAMME, 2018b. *Water pumps to improve irrigation for dry zone farmers.* [Viewed 10 April 2018]. Available from: <http://www.mm.undp.org/content/myanmar/en/home/presscenter/articles/2018/04/03/water-pumps-to-improve-irrigation-for-dry-zone-farmers.html>

Annex D: Case study two

When temperatures soared in the already blazing heat of Myanmar's Dry Zone, Kyaw Htaing was alarmed for the wellbeing of the piglets he was raising. Without any land to his name and depending on occasional farm work for making a living, these piglets were the ticket to a better life. Kyaw Htaing was determined to raise healthy pigs and sell them for a profit.

"I received two piglets in February and once they are six months old, I will be selling them. I hope to earn 400,000 kyats from the sale," said Kyaw Htaing.

The piglets are a special heat resistant breed, provided to landless labourers as part of a project to help people in Myanmar's Dry Zone adapt to climate change. Kyaw Htaing is required to pay 135,000 kyats to reimburse the cost of the piglets. Not only piglets, but goats, and chicks were provided to a group of five people in Bone Bweit village, in Shwebo township, one of the five townships where the "Addressing Climate Change Risks on Water Resources and Food Security in the Dry Zone of Myanmar" project is being implemented.

In late April and early May, it was getting hotter than usual, with temperatures soaring to 45 degrees Celcius in May.

"I am glad the rains came and cooled the temperatures. I was worried that my piglets will not survive the heat. Even if they did not survive, I would still have had to reimburse the costs," said Kyaw Htaing

Another member of the livestock group, Daw Win Htaing received two piglets to raise, but one succumbed to heat in March. She will still need to reimburse 135,000 kyats for the two piglets. She hopes to earn 200,000 kyats when she sells the surviving pig.

The members of the livestock group received basic training on how to raise the animals before they received them. They also benefit from the services of a veterinarian, Dr San Win, who provides advice to the villagers on how to look after their animals.

"When the temperatures get really high, the animals can suffer a heat stroke and die from it. I regularly visit the villagers and check on the health of the animals," he said.

Daw Tin Mar San is part of the same livestock group. She received 30 chicks which would later grow to become egg laying hens. Before the Thingyan festival (in early April), Daw Tin Mar San was getting 15 – 17 eggs every day. By mid-May the egg production fell to one or two per day.

"What I have learnt is that when it is too hot, the chickens do not lay as many eggs. This means I earn less. By August, I have to reimburse the cost of the chicks," she said, noting that egg laying chicks needed a special feed and special care.

Daw Tin Mar San who used to raise ducks before now realises that raising egg laying chickens is different from raising ducks.

Source: UNITED NATIONS DEVELOPMENT PROGRAMME, 2018c. Heat tolerant animals provide a lifeline for vulnerable communities in dry zone. [Viewed 10 April 2018]. Available from: http://www.mm.undp.org/content/myanmar/en/home/ourwork/environmentandenergy/successstories/Heat_Tolerant/

Annex E: Policies for poverty reduction, rural development, disaster risk reduction/management and climate change adaption

| Legislation | Poverty Reduction & Rural Development | Disaster Risk Reduction | Climate Change |
|---|---------------------------------------|-------------------------|----------------|
| Forest Law Act 1992 | ● | ● | ● |
| Wildlife Act 1994 | ● | ● | ● |
| The Control of Smoking and Consumption of Tobacco Product Law 2006 | ● | | |
| Vacant, Fallow and Virgin Land Management Act 2012 | ● | ● | ● |
| Farmland Act 2012 | ● | ● | ● |
| Foreign Exchange Management Law 2012 | ● | ● | ● |
| Important Goods and Services Act 2012 | ● | ● | ● |
| Social Security Law 2012 | ● | ● | ● |
| Families of Disabled or Deceased Soldiers Supporting Act 2012 | ● | | |
| Import - Export Law 2012 | ● | ● | ● |
| Foreign Investment Law 2012 | ● | ● | ● |
| Prevention from Danger of Chemical and Associated Material Law 2013 | ● | ● | ● |
| Employment and Skill Development Law 2013 | ● | | |
| Telecommunication Law 2013 | ● | ● | ● |
| Law of Protection of Farmer Rights and Enhancement of their Benefits 2013 | ● | ● | ● |
| Trade Law 2013 | ● | | ● |
| Myanmar Engineering Council Law 2013 | ● | ● | ● |
| Anti-Corruption Law 2013 | ● | ● | ● |
| Minimum Wage Law 2013 | ● | | |
| Natural Disaster Management Law 2013 | ● | ● | ● |
| Emergency Patient Care Law 2014 | ● | ● | |
| Myanmar National Aviation Law 2014 | ● | ● | ● |
| Inland Water Transport Organisation Law 2014 | ● | ● | ● |
| The Electricity Law 2014 | ● | ● | ● |
| National Education Law 2014 | ● | ● | ● |
| Law on the Myanmar Architectural Council 2014 | ● | ● | ● |
| Law Repealing the Whipping Act 2014 | ● | | |
| Counter-Terrorism Law 2014 | | ● | |
| News Media Law 2014 | ● | ● | ● |
| Early Childhood Development Law 2014 | ● | | |
| Myanmar Special Economic Zones Law 2014 | ● | | ● |
| Multi-Modal Transport Law 2014 | ● | ● | ● |
| Consumer Protection Law 2014 | ● | | |
| National Human Rights Commission Law 2014 | ● | ● | ● |
| Law Protecting Ethnic Rights 2015 | ● | | ● |
| Law Repealing the Farm Produce Market Law 2015 | ● | | ● |
| Competition Law 2015 | ● | | |
| Myanmar Medical Council Law 2015 | ● | | |
| Myanmar Nursing and Birthing Council Law 2015 | ● | | |
| Law on the Rights of Persons with Disabilities 2015 | ● | | |
| Law Concerning Religious Conversion 2015 | ● | | |
| Buddhist Women Special Marriage Law 2015 | ● | | |

| Legislation | Poverty Reduction & Rural Development | Disaster Risk Reduction | Climate Change |
|--|---------------------------------------|-------------------------|----------------|
| Law on the Practice of Monogamy 2015 | ● | | |
| Law repealing the Retirement Act 2015 | ● | | |
| Myanmar Red Cross Law 2015 | ● | ● | |
| Law Amending the Insurance Permission Law 2015 | ● | ● | ● |
| Law Amending the Foreign Investment Act 2015 | ● | ● | ● |
| Myanmar Coastal Authority Law 2015 | ● | ● | ● |
| Law on the development of small and medium business 2015 | ● | ● | ● |
| Coastal and Maritime Transport Law 2015 | ● | ● | ● |
| Law regarding Inland Water Transport Vessels 2015 | ● | ● | ● |
| Law Amending the Myanmar Mining Law 2015 | ● | ● | ● |
| Law Protecting Ancient Objects 2015 | | ● | |
| Law on the Preservation and Protection of Ancient Buildings 2015 | | ● | |
| Broadcasting Law 2015 | ● | ● | |
| Law Amending the 1954 National Titles Law 2015 | ● | ● | ● |
| Automobile Law 2015 | ● | ● | ● |
| Highways Law 2015 | ● | ● | ● |
| Urban and Regional Development Act 2015 | ● | ● | ● |
| Public Debt Management Law 2016 | ● | ● | ● |
| Road Carriers Law 2016 | ● | ● | ● |
| Rail Carriers Law 2016 | ● | | |
| Legal Aid Law 2016 | ● | ● | |
| Bank and National Planning Law 2016 | ● | | |
| The Law on Financial Institution 2016 | ● | | |
| Payment of Wages Law 2016 | ● | | |
| National Tax Law 2016 | ● | ● | ● |
| Pesticide Act 2016 | ● | | ● |
| Law on Protecting New Species of Plants 2016 | ● | ● | ● |
| Myanmar Companies Law 2017 | ● | ● | ● |
| Petroleum and Petroleum Products Law 2017 | ● | ● | ● |

Table 13 Relevant legislation to poverty reduction, rural development, disaster risk reduction/management and climate change adaption

Annex F: Policies for poverty reduction, rural development, disaster risk reduction/management and climate change adaption

| Policies | Poverty Reduction & Rural Development | Disaster Risk Reduction | Climate Change |
|---|---------------------------------------|-------------------------|----------------|
| National Environment Policy 1994 | ● | ● | ● |
| MoF Myanmar Forest Policy 1995 | ● | ● | ● |
| MoF Myanmar Agenda 21 1997 | ● | ● | ● |
| MoH Health in Myanmar 2014 | ● | | |
| NRWRC National Water Policy 2014 | ● | ● | ● |
| MoSWRR Guidance on Mainstreaming Disaster Risk Reduction in the Health Sector, Myanmar Rural Settings 2014 | ● | ● | ● |
| MoSWRR Guidance on Mainstreaming Disaster Risk Reduction in the Education Sector, Myanmar Rural Settings 2014 | ● | ● | ● |
| MoC Urban Development and Green Growth Policy Forum PowerPoint Presentation 2014 | | | |
| MoE Myanmar Energy Master Plan 2015 | | | |
| MoECF Myanmar's Intended Nationally Determined Contribution 2015 | ● | ● | ● |
| MoEE National Electricity Master Plan 2016 | ● | ● | ● |
| MoT Myanmar Transport Sector Policy Note: Urban Transport 2016 | ● | ● | ● |
| MoT Myanmar Transport Sector Policy Note: Railways 2016 | ● | ● | ● |
| UoM National Economic Policy 2016 | ● | ● | ● |
| Mol Industrial Policy 2016 | ● | ● | ● |
| MoHS National Health Policy 2016 | ● | | |
| MoECF National Land Use Policy 2016 | ● | ● | ● |
| MoPF Myanmar Public Private Partnership Policy (Draft) 2016 | ● | ● | ● |
| MoNREC National Environmental Policy of Myanmar (Draft) 2016 | ● | ● | ● |
| MoNREC Policy brief: Climate change and private sector resilience in Myanmar 2017 | ● | ● | ● |
| MoNREC Policy guidance 1: Climate smart agriculture, fisheries and livestock for food security 2017 | ● | ● | ● |
| MoNREC Policy guidance 2: Sustainable management of natural resources for healthy ecosystems 2017 | ● | ● | ● |
| MoNREC Policy guidance 3: Resilient low carbon energy, transport and industrial systems for sustainable growth 2017 | ● | ● | ● |
| MoNREC Policy guidance 4: Building resilient, inclusive and sustainable cities and towns in Myanmar 2017 | ● | ● | ● |
| MoNREC Policy guidance 5: Managing climate risks for peoples health and wellbeing 2017 | ● | ● | ● |
| MoNREC Policy guidance 6: Building a resilient Myanmar society through education, science and technology 2017 | ● | ● | ● |
| MoC National Urban Policy Framework 2017 | ● | ● | ● |
| MOC National Housing Policy and Strategy 2017 | ● | ● | ● |
| MoHA Myanmar Drug Control Policy 2018 | ● | ● | ● |
| MoPF Myanmar Development Assistance Policy 2018 | ● | ● | ● |
| MSWRR Meiktila Township Disaster Management Plan 2018 | ● | ● | ● |

Table 14 Relevant policies to poverty reduction, rural development, disaster risk reduction/management and climate change adaption

Annex G: Strategies, programs and plans for poverty reduction, rural development, disaster risk reduction/management and climate change adaption

| Strategies, Programs and Plans | Poverty Reduction & Rural Development | Disaster Risk Reduction | Climate Change |
|--|---------------------------------------|-------------------------|----------------|
| MOF National Tiger Action Plan for the Union of Myanmar 2003 | ● | | ● |
| MoSWRRRD Myanmar Action Plan on Disaster Risk Reduction 2009-2015 2009 | ● | ● | ● |
| MoF National Sustainable Development Strategy 2009 | ● | ● | ● |
| UoM Framework for Economic and Social Reform 2012 | ● | ● | ● |
| MoECF Initial National Communication under UN Framework Convention 2012 | ● | ● | ● |
| MoSWRR Myanmar Action Plan on Disaster Risk Reduction 2012 | ● | ● | ● |
| MoECF National Adaption Program to Action Climate Change 2012 | ● | ● | ● |
| MoSWRR National Strategic Plan for the Advancement of Women 2013-2022 2013 | ● | ● | ● |
| MoSWRR Myanmar National Social Protection Strategic Plan 2014 | ● | ● | ● |
| UoM Myanmar Financial Inclusion Roadmap 2015 | ● | ● | ● |
| MoAI Myanmar and Climate Smart Agriculture Strategy 2015 | ● | ● | ● |
| MoECF National Biodiversity Strategy and Action Plan 2015-2020 2015 | ● | ● | ● |
| MoLAI Formulation and Operationalisation of National Action Plan for Poverty Alleviation and Rural Development through Agriculture: Land Tenure and Administration. 2016 | ● | ● | ● |
| MoTC Myanmar e-Governance Master Plan 2016 | ● | ● | ● |
| MoHS National Health Plan 2017-2021 2016 | ● | | |
| MoHS Myanmar Health Vision 2030 2016 | ● | | |
| MOALI National Strategy for WASH 2016-2030 2016 | ● | ● | ● |
| MoSWRR National Framework on Community Disaster Resilience 2017 | ● | ● | ● |
| MoSWRR National Action Plan on Disaster Risk Reduction 2017 | ● | ● | ● |
| National Climate Change Strategy and Action Plan (Final Draft) 2017 | | | |
| MCDC Waste Management Strategy and Action Plan for Mandalay City 2017-2030 2017 | ● | ● | ● |
| MoALI Township Rural Development Strategy and Programme Myanmar Guidelines 2017 | ● | ● | ● |
| MoNREC Myanmar Climate Change Strategy and Action Plans 2016-2030 PowerPoint presentation 2017 | ● | ● | ● |
| MoNREC National REDD+ Strategy for comment 2018 | ● | ● | ● |

Table 15 Strategies, programs and plans for poverty reduction, rural development, disaster risk reduction/management and climate change adaption

Annex H: Assessments and tools for poverty reduction, rural development, disaster risk reduction/management and climate change adaption

| Assessments and Tools | Poverty Reduction & Rural Development | Disaster Risk Reduction | Climate Change |
|---|---------------------------------------|-------------------------|----------------|
| Intergovernmental Panel on Climate Changes Assessment Reports | ● | ● | ● |
| GoUoM Post Nargis Joint Assessment 2008 | ● | ● | ● |
| Deterministic and Probabilistic Seismic Zoning Map of Myanmar 2008 | | ● | ● |
| UNEP Myanmar National Environmental Performance Assessment Report 2008 | ● | ● | ● |
| UNDP Community Based Disaster Risk Management Manual 2009 | ● | ● | ● |
| Uo M Hazard Profiling of Myanmar 2009 | ● | ● | ● |
| Multi-Hazard Risk Assessments for Ayeyarwady, Bago, Yangon 2011 | ● | ● | ● |
| Multi Hazard Risk Assessment of Rakhine State of Myanmar 2011 | ● | ● | ● |
| DoSWRR Disaster Management Course: Participants Workbook 2012 | | ● | ● |
| Earthquake Risk Assessment of Mandalay 2012 | | ● | ● |
| Deterministic and Probabilistic Seismic Zoning Map of Myanmar 2012 | | ● | ● |
| MoNPEC Resilient Development Planning in Myanmar: An Overview 2013 | ● | ● | ● |
| Earthquake risk assessment of Bago, Taungoo and Sagaing City 2013 | | ● | |
| MMIS Full Collection 2014 Union of Myanmar Census Reports and Statistics 2014 | ● | ● | ● |
| MoT Myanmar Integrated Water Resources Management Strategic Study 2014 | ● | ● | ● |
| MoSWRR National Training on Mainstreaming Disaster and Climate Risk Management in Development Planning in Myanmar: Facilitators Workbook 2014 | ● | ● | ● |
| MoSWRR National Training on Mainstreaming Disaster and Climate Risk Management in Development Planning in Myanmar: Participants Workbook 2014 | ● | ● | ● |
| Seismic hazard assessment of Yangon City 2015 | | ● | ● |
| Earthquake risk assessment of Pyay City 2015 | ● | | |
| MoNPED Investment Policy Reviews 2015 | ● | ● | ● |
| CSO Myanmar Business Survey 2015 Data Report 2015 | ● | ● | ● |
| MoSWRR Sendai Framework for Disaster Risk Reduction 2015-2030 2015 | ● | ● | ● |
| MoLFRD Guidelines on Village Development Process Planning 2015 | ● | ● | ● |
| MoAI Agriculture and Livelihood Flood Impact Assessment in Myanmar 2015 | ● | ● | ● |
| GoUoM Myanmar Post Disaster Needs Assessment on Floods and Landslides 2015 | ● | ● | ● |
| MoAI Myanmar Agro-ecological Atlas 2015 | ● | ● | ● |
| BRACED Climate extremes and resilient poverty reduction 2015 | ● | ● | ● |
| BRACED Community Resilience Assessment and Action Handbook 2015 | ● | ● | ● |
| MCCR Inclusive Community Based Disaster Risk Reduction 2015 | ● | ● | ● |
| MCCR Inclusive Framework and Toolkit for Community Based Disaster Risk Reduction 2015 | ● | ● | ● |

| Assessments and Tools | Poverty Reduction & Rural Development | Disaster Risk Reduction | Climate Change |
|--|---------------------------------------|-------------------------|----------------|
| Assessment of three factors affecting Myanmar's forest cover change using Landsat and MODIS vegetation continuous fields data 2015 | ● | ● | ● |
| LEARN Learning about Nutrition: A Facilitators Guide 2015 | ● | | |
| FAO Global Forest Resources Assessment Country Report Myanmar 2015 | ● | ● | ● |
| EU Myanmar Forest Cover Change 2002-2014 2015 | ● | ● | ● |
| MoSWRR Roadmap for Risk Assessment Myanmar 2015 | | ● | ● |
| MoHS Myanmar Demographic and Health Survey 2015-16 2016 | ● | | |
| MoC Urban Development Planning for Regional Cities - Mandalay, Patheingyi and Mawlamyine 2016 | ● | ● | ● |
| MoSWRR ASEAN Disaster Recovery Reference Guide 2016 | ● | ● | ● |
| MoSWRR Gender Equality and Women's Rights in Myanmar: A Situation Analysis 2016 | ● | ● | ● |
| MoNREC Assessing Climate Risk in Myanmar. Technical Report 2016 | ● | ● | ● |
| MoECAF Challenges at National level forest cover change assessment in Myanmar PowerPoint presentation 2016 | ● | ● | ● |
| UNHABITAT Climate Profile Myanmar 2016 | ● | ● | ● |
| Seismic Profile of Myanmar 2016 | | ● | ● |
| Global Agriculture and Food Security Private Sector Window Country Diagnostic Myanmar 2016 | ● | ● | ● |
| MoSWRR Earthquake Project Pamphlet 2017 | ● | ● | ● |
| MoPF Analysis of Poverty in Myanmar Part 2 Poverty Profile 2017 | ● | | ● |
| MoPF Analysis of Poverty in Myanmar Part 1 Trends Between 2004/05 and 2015 2017 | ● | | ● |
| MoNREC Scenario for building resilience in Pakokku Township: Climate Change Vulnerability Assessment 2016-2020 Policy Summary 2017 | ● | ● | ● |
| MoNREC Scenario for building resilience in Pakokku Township: Climate Change Vulnerability Assessment 2016-2020 Technical Report 2017 | ● | ● | ● |
| MoNREC Scenario for building resilience in Labutta Township: Climate Change Vulnerability Assessment 2016-2020 Policy Summary 2017 | ● | ● | ● |
| MoNREC Scenario for building resilience in Labutta Township: Climate Change Vulnerability Assessment 2016-2020 Technical Report 2017 | ● | ● | ● |
| MoSWRR Building Resilience in Earthquake Prone Areas Pamphlet 2017 | ● | ● | ● |
| CSO Measuring Myanmar's starting point for the Sustainable Development Goals: SDG Indicator Baseline 2017 | ● | ● | ● |
| MoHS Public Health Statistics 2014-2016 2017 | ● | | |
| MoHS Demographic and Health Survey 2015-2016 2017 | ● | | |
| UNDP Evaluation of Disaster Risk Reduction Project 2017 | | ● | ● |
| BRACED Towards a Resilient Myanmar 2017 | ● | ● | ● |
| Assessing ecosystem service provision under climate change to support conservation and development planning in Myanmar 2017 | ● | ● | ● |
| MoNREC Myanmar drivers of deforestation and forest degradation in Myanmar 2017 | ● | ● | ● |
| MEI Meiktila Township Environmental Assessment Report 2017 | | | |
| MOTC Improvement of river systems in the Ayeyawady delta 2017 | ● | ● | ● |

| Assessments and Tools | Poverty Reduction & Rural Development | Disaster Risk Reduction | Climate Change |
|---|---------------------------------------|-------------------------|----------------|
| MoNREC Forest reference emission level in Myanmar 2018 | ● | ● | ● |
| BRACED New Methods in Resilience Measurement 2018 | ● | ● | ● |
| Flood Risk Assessment for Hpa An Ongoing | | ● | ● |
| Flood Risk Assessment Yangon, Mawlamyine and Mandalay Ongoing | | ● | ● |
| Flood Risk Assessment of Bago River Basin Ongoing | | ● | ● |
| Seismic Risk Assessment of Yangon City Ongoing | | ● | ● |

Table 16 Assessments and tools for poverty reduction, rural development, disaster risk reduction/management and climate change adaption

Annex I: INGO and NGO projects and programs in Ngaputaw, Pathein and Meiktila

Ngaputaw

| Organization | Sector | Sub Sector | Township | Village Tract Town | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|--------------------------------------|-------------------------|--|----------|--------------------|--|-----------------------------|----------------------------|----------------------|
| Karuna Mission Social Solidarity | Agriculture | Agricultural Alternative Development | Ngapudaw | Kyar Kwin | Improve Sustainable Agriculture and Saving Practices then strengthen farmers association | Oct | 2018 | Under Implementation |
| Karuna Mission Social Solidarity | Agriculture | Capacity Building (Agricultural Livelihood) | Ngapudaw | Sin Ku Gyi | Enhancing capacity of 9 FLE farmers | May | 2018 | Under Implementation |
| Action Aid Myanmar | Disaster Risk Reduction | Community based Disaster Preparedness and Risk Reduction | Ngapudaw | Ah Yoe Dar | Community Led Development Programme (3) | Jul | 2022 | Under Implementation |
| HelpAge International | Disaster Risk Reduction | Community based Disaster Preparedness and Risk Reduction | Ngapudaw | Ah Htet Pyun | Disaster Risk Reduction | Oct | 2017 | Under Implementation |
| Plan International | Disaster Risk Reduction | Preparedness and Response Programs | Ngapudaw | Kwin Bet | DIPECHO | | | Under Implementation |
| KT Care Foundation | Education | Non-Formal Education | Ngapudaw | Thet Kei Thaug | Computer Training Center | Oct | 2018 | Under Implementation |
| KT Care Foundation | Education | Quality Basic Education/Formal Education | Ngapudaw | Thet Kei Thaug | Scholarship | | | Under Implementation |
| Mercy Corps | Governance | Institutional Strengthening and Public Administration Reform | Ngapudaw | Ah Htet Pyun | National Community Driven Development Project | Dec | 2020 | Under Implementation |
| Share Mercy | Governance | Housing, Property and Land Reform | Ngapudaw | | PRALAFFPOAL | | | Under Implementation |
| United Nations Development Programme | Governance | Strengthening civil society | Ngapudaw | | Local Governance Programme | Dec | 2017 | Under Implementation |

| Organization | Sector | Sub Sector | Township | Village Tract Town | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|--|-------------------------|--|----------|--------------------|--|-----------------------------|----------------------------|----------------------|
| John Snow Inc. (JSI Research & Training Institute) | Health | Reproductive Health Care | Ngapudaw | | RH Commodity Logistic Management Information System | Dec | 2018 | Under Implementation |
| Population Services International | Health | Control of Communicable Diseases | Ngapudaw | Ah Htet Pyun | | | | Under Implementation |
| Population Services International | Health | TB Programme | Ngapudaw | Ah Htet Pyun | | | | Under Implementation |
| Save the Children in Myanmar | Health | Maternal and Child Health | Ngapudaw | Ah Htet Pyun | 3MDG-MNCH Project | | | Under Implementation |
| United Nations Children's Fund | Health | HIV/AIDS Programme | Ngapudaw | | HIV and Children (including PMTCT) | | | Under Implementation |
| United Nations Population Fund | Health | Reproductive Health Care | Ngapudaw | | Programme for RHCS & Capacity Development in Myanmar | Dec | 2017 | Under Implementation |
| United Nations World Health Organization | Health | Malaria Programme | Ngapudaw | | Prevention and Control of Malaria | Dec | 2017 | Under Implementation |
| World Vision | Health | Health Education | Ngapudaw | Ah Htet Pyun | Einme Cookstoves Pilot Project | Jun | | Under Implementation |
| Pact Global Microfinance Fund | Livelihoods | Micro-Finance | Ngapudaw | Ah Htet Pyun | Pact Global Microfinance Fund (PGMF) | | | Under Implementation |
| Terre des hommes - lausanne | Protection | Child Protection | Ngapudaw | Oke Shit Kwin | Child Protection | Dec | 2017 | Under Implementation |
| United Nations Children's Fund | Education | Quality Basic Education/Formal Education | Ngapudaw | | BEGE/KG | Dec | 2017 | Planned |
| Action Aid Myanmar | Disaster Risk Reduction | Community based Disaster Preparedness and Risk Reduction | Ngapudaw | Ah Yoe Dar | Ready for Anything | Jul | 2016 | Completed |

| Organization | Sector | Sub Sector | Township | Village Tract Town | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|---------------------------------------|-------------------------|--|----------|--------------------|---|-----------------------------|----------------------------|----------------|
| OXFAM International | Disaster Risk Reduction | Community based Disaster Preparedness and Risk Reduction | Ngapudaw | Kwin Bet | DipECHO | Dec | 2015 | Completed |
| United Nations Children's Fund | Education | Non-Formal Education | Ngapudaw | | BEGE/Life-skill | | 2017 | Completed |
| Action Aid Myanmar | Governance | Public sector financial management | Ngapudaw | Kyauk Pon | Promoting Just and Democratic Governance in the Reform Process in Myanmar | Apr | 2017 | Completed |
| Action Aid Myanmar | Governance | Public sector financial management | Ngapudaw | Kyauk Pon | Citizens for Accountability in Public Service Financing (CAPSF) | Sep | 2014 | Completed |
| Norwegian People's Aid | Governance | Elections | Ngapudaw | | Voter Education & Observation Trainings and Observation for General Election 2015 | Apr | 2016 | Completed |
| Share Mercy | Governance | Elections | Ngapudaw | | BUWPIE | Dec | 2015 | Completed |
| Share Mercy | Governance | Media and flow of Information | Ngapudaw | | BUCIDE | Nov | 2015 | Completed |
| Action Aid Myanmar | Health | Health Education | Ngapudaw | Ah Yoe Dar | Adolescent Engagement in Myanmar | Dec | 2016 | Completed |
| Network Activities Group | Infrastructure | Rehabilitation-Community Infrastructure & Facility | Ngapudaw | Ahr Kar | Enhancing Rural Livelihoods & Incomes Project | Dec | 2016 | Completed |
| Association for Aid and Relief, Japan | Protection | Persons with Disabilities | Ngapudaw | Dee Du Kone | Community Based Rehabilitation Project for PWDs in Yangon and Ayeywarwaddy Division | Jan | 2010 | Completed |

Pathein Township

| Organization | Sector | Sub Sector | Township | Village Tract Town | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|--|------------------------------------|--|----------|--------------------|---|-----------------------------|----------------------------|----------------------|
| Asian Development Bank | Infrastructure | Not Specified | Pathein | | Transformation of Urban Management | Dec | 2016 | Under Implementation |
| Association François-Xavier Bagnoud | Peace Building Conflict Prevention | Conflict transformation and Peacebuilding | Pathein | | Community-led Development through Theatre Project/ Human Drama Project | Dec | 2018 | Under Implementation |
| CARE International in Myanmar | Health | HIV/AIDS Programme | Pathein | Pathein Town | Community Home-Based Care Project | Dec | | Under Implementation |
| Christian AID | Governance | Institutional Strengthening and Public Administration Reform | Pathein | | Supporting Participation, Accountability, and Civil Society Empowerment (SPACE) | | | Under Implementation |
| Christian AID | Livelihoods | Support to CSOs | Pathein | | Youth Leadership, Empowerment, and Active participation in Democracy (Y-LEAD) | | 2020 | Under Implementation |
| Cord | Peace Building Conflict Prevention | Conflict transformation and Peacebuilding | Pathein | | SPEED | Mar | 2018 | Under Implementation |
| DanChurchAid and Norwegian Church Aid, Myanmar | Mine Action | Victim Assistance | Pathein | | Empowering landmine survivors, victims and persons with disabilities in Myanmar to cope with the negative impacts of physical handicaps | Dec | 2017 | Under Implementation |
| Diakonia | Agriculture | Agricultural Assessment | Pathein | Sa Par Htar | RIDPCM | Dec | 2017 | Under Implementation |
| Diakonia | Agriculture | Livestock and poultry Inputs | Pathein | Lay Myet Hnar Kone | RIDPCM | Dec | 2017 | Under Implementation |

| Organization | Sector | Sub Sector | Township | Village Tract Town | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|---|------------------------------------|---|----------|--------------------|--|-----------------------------|----------------------------|----------------------|
| Diakonia | Education | Non-Formal Education | Pathein | | Community Management Course | Dec | 2020 | Under Implementation |
| Eden Centre for Disabled children | Education | Early Childhood Development | Pathein | Pathein Town | Early Intervention for Disabled Children | Oct | 2017 | Under Implementation |
| Groupe Energies Renouvelables, Environnement et Solidarités | Environment | Renewable Energy and Energy Efficiency | Pathein | Htan Kant Lant | Upscaling Dissemination of Improved Cookstoves in Myanmar Through Replication of Best Practice from The Region | Jul | 2018 | Under Implementation |
| HelpAge International | Health | Community Home Based Care | Pathein | Ah Nan Kone | Supporting older people self-help group | Dec | 2017 | Under Implementation |
| ICCO Cooperation | Peace Building Conflict Prevention | Conflict transformation and Peacebuilding | Pathein | | Story of Friendship | Dec | 2019 | Under Implementation |
| International HIV/AIDS Alliance | Health | HIV/AIDS Programme | Pathein | | Global Fund | Dec | 2017 | Under Implementation |
| Jhpiego - an affiliate of Johns Hopkins University | Health | Maternal and Child Health | Pathein | Pathein Town | Improved Midwifery for Maternal, Newborn, and Child Health Services | Dec | 2018 | Under Implementation |
| Jhpiego - an affiliate of Johns Hopkins University | Health | Maternal and Child Health | Pathein | Pathein Town | same as above | | | Under Implementation |
| Marie Stopes International | Health | HIV/AIDS Programme | Pathein | | Youth, HIV and ARH | Dec | 2018 | Under Implementation |
| Marie Stopes International | Health | HIV/AIDS Programme | Pathein | | HIV prevention and care | Dec | 2018 | Under Implementation |
| Marie Stopes International | Health | Reproductive Health Care | Pathein | | Reproductive Health | Dec | 2018 | Under Implementation |
| Marie Stopes International | Health | Reproductive Health Care | Pathein | | Reproductive Health for Young People | Dec | 2018 | Under Implementation |

| Organization | Sector | Sub Sector | Township | Village Tract Town | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|---|-------------|--|----------|------------------------|--|-----------------------------|----------------------------|----------------------|
| Monastic Education Development Group | Education | Quality Basic Education/Formal Education | Pathein | | Educate A Child | Mar | 2019 | Under Implementation |
| Myanmar Consumers Union | Governance | Access to Justice | Pathein | | Organizational strengthening and Consumer Complaint System | Sep | 2017 | Under Implementation |
| Myanmar Council of Churches | Agriculture | Crop Inputs | Pathein | Sa Par Htar | RIDPCM | Dec | 2017 | Under Implementation |
| Myanmar Environment Rehabilitation-Conservation Network | Environment | Not Specified | Pathein | Chaung Thar | Forest and Farm Facility | Dec | 2017 | Under Implementation |
| Myanmar Medical Association | Health | TB Programme | Pathein | | Public Private Mix TB Project | Dec | 2020 | Under Implementation |
| Population Services International | Health | HIV/AIDS Programme | Pathein | | | | | Under Implementation |
| Population Services International | Health | Reproductive Health Care | Pathein | | | | | Under Implementation |
| Population Services International | Health | TB Programme | Pathein | Chaung Thar | | | | Under Implementation |
| Proximity Designs | Agriculture | Irrigation Water Resources | Pathein | Ah Lel (a) Ah Lel Kone | Irrigation | | | Under Implementation |
| Pyi Gyi Khin | Governance | Human Rights Promotion and Advocacy | Pathein | Pathein Town | Enabling Environment to access to HIV prevention and treatment/care services through promotion of law and policies in State and Region | Dec | 2017 | Under Implementation |

| Organization | Sector | Sub Sector | Township | Village Tract Town | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|------------------------------|-------------|---------------------------|----------|--------------------|---|-----------------------------|----------------------------|----------------------|
| Pyi Gyi Khin | Health | Health Education | Pathein | Pathein Town | Strengthening of M&E System at township level for HIV, TB and Malaria Program under Health System Strengthening (HSS) in Myanmar | Dec | 2017 | Under Implementation |
| Pyi Gyi Khin | Health | HIV/AIDS Programme | Pathein | Pathein Town | Enhance the quality of life of PLHA through ART provision, psychosocial support and increase the access to prevention services among key populations. Approach with Key Population Services Centre (KPSC) | Dec | 2017 | Under Implementation |
| Pyi Gyi Khin | Health | HIV/AIDS Programme | Pathein | | Support ART Centers and Decentralized Sites for ART access, logistic, data management | Dec | 2017 | Under Implementation |
| Ratana Metta Organization | Protection | Child Protection | Pathein | | Protecting Children in Emergencies and Against Grave Violations in conflict project | Dec | | Under Implementation |
| Ratana Metta Organization | Protection | Child Protection | Pathein | | Community mobilization for the rights and protection for street working children | Dec | 2017 | Under Implementation |
| Religions for Peace- Myanmar | Environment | Climate Change Mitigation | Pathein | | Mobilizing Interreligious Networks to Confront Climate Change in Myanmar | Nov | 2017 | Under Implementation |
| Save the Children in Myanmar | Protection | Child Protection | Pathein | | Case Management | Dec | 2017 | Under Implementation |
| Save the Children in Myanmar | Protection | Child Protection | Pathein | | Demobilization | Dec | 2017 | Under Implementation |

| Organization | Sector | Sub Sector | Township | Village Tract Town | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|--------------------------------|------------------------------------|---|----------|--------------------|---|-----------------------------|----------------------------|----------------------|
| Stromme Foundation | Livelihoods | Support to CSOs | Pathein | Hpa Yar Chaung | DREAM-Development and Rehabilitation of the Economy of the poor through Alternative Means | Dec | 2019 | Under Implementation |
| Swedish Red Cross | Disaster Risk Reduction | Mainstreaming of Disaster Risk Reduction into development | Pathein | Kyauk Chaung Gyi | Accountable Resilience Branches Project | Dec | 2019 | under implementation |
| Terre des hommes - lausanne | Protection | Child Protection | Pathein | Pathein Town | Child Protection | Dec | 2017 | Under Implementation |
| Tha Bar Wa Centre | Livelihoods | Cash for Work | Pathein | Sar Hpyu Su | Tha Bar Wa Meditation Centre and Ba Ka School | | | Under Implementation |
| The Leprosy Mission Myanmar | Protection | Persons with Disabilities | Pathein | Ah Nan Kone | Integrated Rehabilitation and Improve Access | Dec | 2018 | Under Implementation |
| The Leprosy Mission Myanmar | Protection | Persons with Disabilities | Pathein | Thit Poke Kone | Community Based Rehabilitation Phase 3 | Dec | 2018 | Under Implementation |
| Third Story Project | Peace Building Conflict Prevention | conflict transformation and Peacebuilding | Pathein | | Story of Friendship | Feb | 2020 | Under Implementation |
| United Nations Children's Fund | Disaster Risk Reduction | Community based Disaster Preparedness and Risk Reduction | Pathein | | DRR Youth Volunteer Programme | Dec | 2017 | Under Implementation |
| United Nations Children's Fund | Health | HIV/AIDS Programme | Pathein | | HIV and Children (including PMTCT) | | | Under Implementation |
| United Nations Children's Fund | Health | Maternal and Child Health | Pathein | | Emergency Paediatric Care Program | Dec | 2017 | Under Implementation |

| Organization | Sector | Sub Sector | Township | Village Tract Town | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|--|------------|---------------------------------------|----------|--------------------|--|-----------------------------|----------------------------|----------------------|
| United Nations Children's Fund | Nutrition | IEC on Infant and Child feeding | Pathein | | Supporting children in the first '1000' days of life and beyond, to reduce child mortality and stunting in high burden states and regions of Myanmar | Jan | 2019 | Under Implementation |
| United Nations Children's Fund | Nutrition | Inpatient Therapeutic Programme (ITP) | Pathein | | Hospital-based treatment for under-five children with severe acute malnutrition | Dec | 2017 | Under Implementation |
| United Nations Children's Fund | Protection | Child Protection | Pathein | Kan Ni | Child protection case management | | | Under Implementation |
| United Nations Children's Fund | Protection | Child Protection | Pathein | | Awareness, mine victims support | Aug | | Under Implementation |
| United Nations Children's Fund | Protection | Child Protection | Pathein | | Support to the Anti-Trafficking in Persons Division | | | Under Implementation |
| United Nations Children's Fund | Protection | Child Protection | Pathein | | Promoting Child Safe Tourism and Online Environment in Myanmar | Jan | 2018 | Under Implementation |
| United Nations Development Programme | Governance | Not Specified | Pathein | | Democratic Governance | Dec | 2017 | Under Implementation |
| United Nations Population Fund | Health | Reproductive Health Care | Pathein | | Sexual and Reproductive Health | Dec | 2017 | Under Implementation |
| United Nations Population Fund | Health | Reproductive Health Care | Pathein | | Youth and ARH | Dec | 2017 | Under Implementation |
| United Nations Population Fund | Health | Reproductive Health Care | Pathein | | Programme for RHCS & Capacity Development in Myanmar | Dec | 2017 | Under Implementation |
| United Nations World Health Organization | Health | Control of Communicable Diseases | Pathein | | Routine immunization programme | Dec | 2017 | Under Implementation |

| Organization | Sector | Sub Sector | Township | Village Tract Town | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|--|-------------|------------------------------------|----------|--------------------|---|-----------------------------|----------------------------|----------------------|
| United Nations World Health Organization | Health | HIV/AIDS programme | Pathein | | Prevention and control of HIV/AIDS | Dec | 2017 | Under Implementation |
| United Nations World Health Organization | Health | Malaria Programme | Pathein | | Prevention and Control of Malaria | Dec | 2017 | Under Implementation |
| United Nations World Health Organization | Health | TB programme | Pathein | | Prevention and control of Tuberculosis | Dec | 2017 | Under Implementation |
| World Child Cancer | Health | Revitalization of existing HS - HR | Pathein | | Twinning Programme | Dec | 2018 | Under Implementation |
| World Vision | Education | Non-Formal Education | Pathein | Kyaung Pan Kone | Pathein Education Project | Oct | 2022 | Under Implementation |
| World Vision | Health | Health Education | Pathein | Htan Kant Lant | Cookstove | | | Under Implementation |
| World Vision | Health | Maternal and Child Health | Pathein | Ah Nan Kone | Pathein Health Project | Oct | 2022 | Under Implementation |
| World Vision | Livelihoods | Income Generation Support | Pathein | Ah Nan Kone | Pathein Livelihood Project | Oct | 2022 | Under Implementation |
| World Vision | Livelihoods | Income Generation Support | Pathein | Pathein Town | Pathein Education Project | Oct | 2022 | Under Implementation |
| World Vision | Livelihoods | Income Generation Support | Pathein | Pathein Town | Pathein Health Project | Oct | 2022 | Under Implementation |
| World Vision | Protection | Child Protection | Pathein | Ah Nan Kone | Pathein Child Development Project | Oct | 2022 | Under Implementation |
| Ipas | Health | Reproductive Health Care | Pathein | Pathein Town | Improving Quality of Post Abortion Care Services in Myanmar | Jun | 2020 | Planned |

| Organization | Sector | Sub Sector | Township | Village Tract Town | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|--------------------------------|------------------------------------|---|----------|---------------------------|--|-----------------------------|----------------------------|----------------|
| Share Mercy | Governance | Housing, Property and Land Reform | Pathein | | PRALAFFPOAL | | | Planned |
| United Nations Children's Fund | Education | Quality Basic Education/Formal Education | Pathein | | BEGE/KG | Dec | 2017 | Planned |
| Diakonia | Health | Not Specified | Pathein | | Preparing CSO Report on CEDAW by CAM | Dec | 2016 | Completed |
| HelpAge International | Health | Community Home Based Care | Pathein | Ah Lel (a) Ah Lel Kone | Building Community Organization to Reduce Poverty and Vulnerability amongst Older People their Families in Myanmar | Feb | 2014 | Completed |
| Ratana Metta Organization | Protection | Awareness Raising on Protection Issues | Pathein | | Protecting vulnerable children through Inter religious cooperation in Myanmar | Jul | 2016 | Completed |
| Ratana Metta Organization | Protection | Child Protection | Pathein | | Drop in Centre for street working children | Jun | 2015 | Completed |
| Religions for Peace-Myanmar | Peace Building Conflict Prevention | Conflict transformation and Peacebuilding | Pathein | | Strengthening Religious Collaboration in Myanmar | Jun | 2017 | Completed |
| Religions for Peace-Myanmar | Peace Building Conflict Prevention | Conflict transformation and Peacebuilding | Pathein | | Capacity Building of RfP-M Women of Faith Network | Mar | 2016 | Completed |
| Share Mercy | Governance | Elections | Pathein | | BUWPIE | Dec | 2015 | Completed |
| Share MERCY | Governance | Media and flow of Information | Pathein | | BUCIDE | Aug | 2015 | Completed |
| The Leprosy Mission Myanmar | Protection | Persons with Disabilities | Pathein | Htein Lay Pin Lin Win Gyi | GPAF | | 2016 | Completed |

| Organization | Sector | Sub Sector | Township | Village Tract Town | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|--|-------------------------|--------------------------------------|----------|--------------------------|---|--------------------------------------|----------------------------------|----------------|
| United Nations Children's Fund | Education | Non-Formal Education | Pathein | | BEGE/Life-skill | | 2017 | Completed |
| United Nations Children's Fund | Protection | Child Protection | Pathein | | Child protection case management | May | 2017 | Completed |
| United Nations Human Settlements Programme | Disaster Risk Reduction | Policy and institutional development | Pathein | | Transformation of Urban Management in Myanmar- Capacity Building for Urban Management | Sep | 2016 | Completed |
| World Child Cancer | Health | Revitalization of existing HS - HR | Pathein | | DFID-Global Poverty Action Fund (GPAF) | Jun | 2017 | Completed |

Meiktila Township

| Organization | Sector | Sub Sector | Township | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|--------------------|-------------------------|---|----------|--|-----------------------------|----------------------------|----------------------|
| Action Aid Myanmar | Agriculture | Agriculture Development | Meiktila | Community Led Development Programme (2) | Mar | 2022 | Under Implementation |
| Action Aid Myanmar | Coordination | Information & Communications Technology | Meiktila | Community Led Development Programme (2) | Mar | 2022 | Under Implementation |
| Action Aid Myanmar | Disaster Risk Reduction | Community based Disaster Preparedness and Risk Reduction | Meiktila | Building Resilience and Adaptation of Climate Extreme and Disaster | Dec | 2017 | Under Implementation |
| Action Aid Myanmar | Disaster Risk Reduction | Hazard, vulnerability and risk assessment | Meiktila | Building Resilience and Adaptation of Climate Extreme and Disaster | Dec | 2017 | Under Implementation |
| Action Aid Myanmar | Disaster Risk Reduction | Mainstreaming of Disaster Risk Reduction into development | Meiktila | Building Resilience and Adaptation of Climate Extreme and Disaster | Dec | 2017 | Under Implementation |
| Action Aid Myanmar | Disaster Risk Reduction | Policy and institutional development | Meiktila | Building Resilience and Adaptation of Climate Extreme and Disaster | Dec | 2017 | Under Implementation |
| Action Aid Myanmar | Disaster Risk Reduction | Preparedness and Response Programs | Meiktila | Building Resilience and Adaptation of Climate Extreme and Disaster | Dec | 2017 | Under Implementation |
| Action Aid Myanmar | Disaster Risk Reduction | Public Awareness, Education and Training | Meiktila | Building Resilience and Adaptation of Climate Extreme and Disaster | Dec | 2017 | Under Implementation |
| Action Aid Myanmar | Education | Quality Basic Education/Formal Education | Meiktila | Community Led Development Programme (2) | Mar | 2022 | Under Implementation |
| Action Aid Myanmar | Governance | Strengthening civil society | Meiktila | Community Led Development Programme (2) | Mar | 2022 | Under Implementation |
| Action Aid Myanmar | Livelihoods | Income Generation Support | Meiktila | Community Led Development Programme (2) | Mar | 2022 | Under Implementation |
| Action Aid Myanmar | Protection | Promoting Gender Equality and | Meiktila | Community Led Development Programme (2) | Mar | 2022 | Under Implementation |

| Organization | Sector | Sub Sector | Township | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|---|-------------|---|----------|-----------------------------------|-----------------------------|----------------------------|----------------------|
| | | Empowerment of Women | | | | | |
| Association of Medical Doctors of Asia | Livelihoods | Micro-Finance | Meiktila | Livelihood Improvement Program | | | Under Implementation |
| BRAC Myanmar | Livelihoods | Micro-Finance | Meiktila | Microfinance | | | Under Implementation |
| CESVI Foundation | Agriculture | Agriculture Development | Meiktila | Shae Thot | Mar | 2018 | Under Implementation |
| CESVI Foundation | Agriculture | Capacity Building (Agricultural Livelihood) | Meiktila | Shae Thot | Mar | 2018 | Under Implementation |
| CESVI Foundation | Agriculture | Crop Inputs | Meiktila | Shae Thot | Mar | 2018 | Under Implementation |
| CESVI Foundation | Agriculture | Irrigation Water Resources | Meiktila | Shae Thot | Mar | 2018 | Under Implementation |
| CESVI Foundation | Agriculture | Livestock and poultry inputs | Meiktila | Shae Thot | Mar | 2018 | Under Implementation |
| CESVI Foundation | Governance | Strengthening civil society | Meiktila | Shae Thot | Mar | 2018 | Under Implementation |
| DanChurchAid and Norwegian Church Aid, Myanmar | Governance | Human Rights Promotion and Advocacy | Meiktila | Right for All | Dec | 2019 | Under Implementation |
| International Union Against Tuberculosis and Lung Disease/The Union | Health | HIV/AIDS Programme | Meiktila | Integrated HIV Care Program (IHC) | Dec | 2017 | Under Implementation |

| Organization | Sector | Sub Sector | Township | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|---|-------------|--|---------------------|---|-----------------------------|----------------------------|----------------------|
| International Union Against Tuberculosis and Lung Disease/The Union | Health | TB Programme | Meiktila | Community Base Multi-Drug Resistant Tuberculosis Patient Care | Dec | 2017 | Under Implementation |
| John Snow Inc. (JSI Research & Training Institute) | Health | Reproductive Health Care | (State/Region-wide) | RH Commodity Logistic Management Information System | Dec | 2018 | Under Implementation |
| Korea International Cooperation Agency | Agriculture | Fisheries | (State/Region-wide) | Project for Development of Inland Fish Farming Technology | Dec | 2017 | Under Implementation |
| Local Resource Centre | Governance | Human Rights Promotion and Advocacy | (State/Region-wide) | | | | Under Implementation |
| Local Resource Centre | Governance | Institutional Strengthening and Public Administration Reform | (State/Region-wide) | | | | Under Implementation |
| Mercy Corps | Environment | Renewable Energy and Energy Efficiency | Meiktila | Myanmar Stoves Campaign- Phase II | Dec | 2017 | Under Implementation |
| Monastic Education Development Group | Education | Quality Basic Education Formal Education | Meiktila | Educate A Child | Mar | 2019 | Under Implementation |
| Myanmar Health Assistant Association | Health | Control of Communicable Diseases | Meiktila | Stop TB, Fight TB Together | Dec | 2020 | Under Implementation |
| Myanmar Medical Association | Health | TB Programme | Meiktila | Public Private Mix TB Project | Dec | 2020 | Under Implementation |

| Organization | Sector | Sub Sector | Township | Project Title | Estimated Project End Month | Estimated Project End Year | Project Status |
|-------------------------------|-------------|---|----------|---|-----------------------------|----------------------------|----------------------|
| Pact Global Microfinance Fund | Livelihoods | Micro-Finance | Meiktila | Pact Global Microfinance Fund (PGMF) | | | Under Implementation |
| Ipas | Health | Reproductive Health Care | Meiktila | Improving Quality of Post Abortion Care Services in Myanmar | Jun | 2020 | Planned |
| Action Aid Myanmar | Governance | Access to Justice | Meiktila | Promoting justice towards a violence free environment for women and girls | Nov | 2016 | Completed |
| Action Aid Myanmar | Governance | Public sector financial management | Meiktila | Promoting Just and Democratic Governance in the Reform Process in Myanmar | Apr | 2017 | Completed |
| Action Aid Myanmar | Governance | Public sector financial management | Meiktila | Citizens for Accountability in Public Service Financing (CAPSF) | Sep | 2014 | Completed |
| Action Aid Myanmar | Health | Health Education | Meiktila | Adolescent Engagement in Myanmar | Dec | 2016 | Completed |
| CESVI Foundation | Agriculture | Agriculture Development | Meiktila | Shae Thot | Oct | 2016 | Completed |
| CESVI Foundation | Agriculture | Capacity Building (Agricultural Livelihood) | Meiktila | Shae Thot | Oct | 2016 | Completed |
| CESVI Foundation | Agriculture | Crop Inputs | Meiktila | Shae Thot | Oct | 2016 | Completed |
| CESVI Foundation | Agriculture | Irrigation Water Resources | Meiktila | Shae Thot | Oct | 2016 | Completed |
| CESVI Foundation | Agriculture | Livestock and poultry inputs | Meiktila | Shae Thot | Oct | 2016 | Completed |
| CESVI Foundation | Governance | Strengthening civil society | Meiktila | Shae Thot | Oct | 2016 | Completed |
| Myanmar Red Cross Society | Protection | Child Protection | Meiktila | Children Associated with Armed Conflicts (Armed Forces and Armed Groups) | May | 2016 | Completed |

Table 17 INGO and NGO projects and programs in Ngaputaw, Pathein and Meiktila

Annex J: Attendees at ActionAid Myanmar workshop Nap Pyi Taw

| Government Department | | | | |
|--|-------------|----------|----------|----------|
| Department | Attendance | | | |
| | Nay Pyi Taw | Meiktila | Pathein | Ngaputaw |
| Department of Rural Development (MOLFRD) | 2 | 1 | 1 | 1 |
| Environment Conservation Department (MOECAF) | 1 | | 1 | |
| Agricultural Mechanization Department (MOALI) | 2 | | | |
| Planning and Statistics Department (MOECAF) | 2 | 1 | | |
| Small Scale Industries Department (MOALI) | 1 | | | |
| Department of Agriculture (MOALI) | 2 | 1 | 1 | 1 |
| Department of Agriculture Research (MOALI) | 1 | | | |
| Department of Fisheries (MOLFRD) | 1 | | | |
| Forest Department (MOECAF) | 1 | 1 | 1 | 1 |
| Livestock Breeding and Veterinary Department (MOLFRD) | 1 | 1 | 1 | 1 |
| Department of Agriculture Land Management and Statistics (MOALI) | 1 | | | |
| General Administration Department (MOHA) | | 1 | | |
| Department of Metrology and Hydrology (MOT) | 1 | 1 | 1 | |
| Irrigation and Water Utilization Management Department (MOALI) | 1 | | | |
| Total 34 | 17 | 7 | 6 | 4 |

| INGOs and United Nations Agencies | |
|--|------------|
| Organization | Attendance |
| ActionAid Myanmar | 18 |
| Peace Myanmar Aid Foundation (PMA) | 5 |
| Food and Agriculture Organization of the United Nations (FAO) | 3 |
| United Nations Development Programme (UNDP) | 1 |
| United Nations Children's Fund (UNICEF) | 1 |
| Building Resources Across Communities (BRAC) | 2 |
| Karuna Mission Social Solidarity (KMSS) | 1 |
| Catholic organization for Relief and Development Aid (Cordaid) | 2 |
| Total Attendees | 33 |

Table 18 Attendees at Nap Pyi Taw Workshop

Annex K: References

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