KENGTUNG

TOWNSHIP ENVIRONMENTAL ASSESSMENT

2017

MYANMAR ENVIRONMENT INSTITUTE

BRACED Building Resilience and Adaptation to Climate Extremes and Disasters

MEI

This report has been prepared by Myanmar Environment Institute as part of BRACED Myanmar Consortium(2015-2017)

Abbreviation and Acronyms

BRACED	Building Resilience and Adaptation to Climate Extremes and Disasters
CO2	Carbon Dioxide
CRA	Community Risk Assessment
CSO	Civil Society Organization
CSR	Corporate Social Responsibility
ECD	Environmental Conservation Department
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
Ha	Hectare
IEE	Initial Environmental Examination
Inh/km2	Inhabitant per Kilometer Square
KBA	Key Biodiversity Area
Km	Kilo Meter
M	Meter
MEI	Myanmar Environment Institute
MIMU	Myanmar Information and Management Unit
MOECAF	Ministry of Environmental Conservation and Forestry
MONREC	Ministry of Natural Resource and Environmental Conservation
NCEA	National Commission for Environmental Affair
NFTP	Non Forest Timber Product
NGO	Non-Governmental Organization
RIMES	Regional Integrated Multi -Hazard Early Warning System
SEA	Strategic Environmental Assessment
TDMP	Township Disaster Management Plan
TEA	Township Environmental Assessment

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Introduction and Background

Myanmar Environmental Institute (MEI) has been commissioned under the Building Resilience and Adaptation against Climate Extremes and Disasters (BRACED) project to conduct Township Environmental Assessments (TEA) for selected townships which are identified as vulnerable to natural disaster and climate change. This study is undertaken as a part of BRACED Alliance Project which has aimed to build resilience of 350,000 people in the selected 8 townships from climate extremes and disasters.

As a part of full BRACED project (2015-2017), MEI has committed to undertake eight TEA reports. All TEA reports focus on township level and study plans and economic developments related to that administrative boundary and provide recommendations for decision makers to apply in the planning process that incorporates environmental and social concerns. It furthermore allows for improved awareness of the environment in future planning and policies.

This data will further help to identify potential environmental changes and impacts on communities that might impact on capacities or vulnerabilities within communities.

Environmental Legislative Framework & Enabling Environment for SEA

In Myanmar, EIA (Environmental Impact Assessment) procedure was introduced in December 2015 and is widely practiced in development projects in a number of sectors. According to procedure, investment proposals are required to conduct either EIA or IEE.

Under the Article 123 of section 10 of EIA procedure (2015), it is stated that MONREC may ask relevant authorities to conduct SEA for policy strategy development plan and program prepared by government organizations of state, regional and township administration, self-administered zone and division or private sector projects. However, this section does not provide details on application of SEA's in decision making process or explicitly stress where an SEA is required. An SEA is undertaken by a government department on a specific development plan or project or strategy.

It is concluded that according to existing legislative framework there is not a strong mandatory requirement for conducting SEA.

This study is not intended to replace or substitute any SEA requirement under the EIA procedure. The data presented should support the development of any further environmental studies undertaken by government or private sector actors in Kengtung Township by giving a contextual overview of the situation in the township.

Environmental Scoping

Preliminary scoping study was conducted through stakeholder consultation meetings and desktop review.

The active and potential development plan and other activities identified as having negative environmental consequences are described in the following table with linked issues.

General Scoping

Development and Activities	Key Environmental Issues
Mining	Pressure on biodiversity , erosion and landslide , endangered species , water pollution , , land acquisition,
Waste Management	Air pollution, health and hygiene
Tourism	Waste management , ethnic community
Shifting Cultivation and Other activities	Loss of ecosystem services , biodiversity , Protected Area

Environmental Baseline

The study area is located in eastern Shan State .It is one of the 10 townships in Eastern Shan State, Union of Myanmar . The Township is surrounded by Mingket ,Minelar on the south Mine Pauk , Mine Sat Township, Mine Yaung Township ,Tontar and Mine Pyin Townships.

Climatology

Kengtung receives lesser rainfall compared to townships in the coastal areas, but more rainfall compared to townships in the Central Dry Zone. Located inland, it receives less rainfall from the Southwest Monsoon but benefits from rainfall from remnants of severe weather disturbances from the South China Sea. Kengtung has an annual average rainfall of 1232 mm. The hottest month in March of the Kengtung Township is 28.3 ^{o}C (83^{o} F). It is coolest in December with 17.5 ^{o}C (63.5 F).

According to study conducted for the baseline period of 1981 to 2010, both wet season rainfall and annual rainfall shows an increasing trend. The annual average minimum temperature of township shows a decreasing trend. However, annual average maximum temperature shows an increasing trend.

Air Quality and Water Quality

Since there is no major industry development in the area, degradation of air quality in the study are is considered insignificant. Water quality result from Naungtong Lake and other streams in the study area are described in appendix section.

Ecoregion, KBA and Protected Area

The study area falls within ecoregion of Northern Indochina subtropical forests. Loimwe National Park is located to the southeast of Kengtung town. This national park is listed as protected area of Myanmar. The terrestrial protected area was established in 1996 near the hill station with conservation purpose.

Biodiversity

Kengtung town is located in a valley surrounded by mountainous area. Forest coverage in mountain area is considered high. Most of the forest are degraded forest in which canopy is between 10% and 80%. Intact forests are located on the steep mountain range

As habitats, forest, mixed forest, grass land, shrub land, crop and vegetation and urban built up area can be observed. Large portion of crop land are identified in the low-lying area of Kengtung town.

It is informed that number of wildlife in the region has been notably decreasing due to hunting and wildlife trading. Endangered species in the region are reported as tiger, bear, wild cat , turtle , barking deer and some boar. The study is close to border areas with Thailand and China .Consequently, hunting and trading of wild animal have intensified in the area. The widely commoditized wildlife animals are snakes, turtle, pangolin, bears, tiger and elephants.

Land Use

In 2015-16, 55970.04 hectares of land were used for agriculture which represented about 14.78 percent of the total area of the township. Much of the agricultural land is used primarily for growing paddy.

Social Baseline

Total population of Kengtung is 171,620 people with 87,779 males and 83 841 females in 2014. Total house hold is 34096. 74 % of total populations live in rural area.

Kengtung is home to many ethnic minorities. Akar, Ann (Eng) , Lahu, Loi , Wa ,Palaung (Ta'ang) and Tai tribes live in Kengtung and surrounding hills. Being a center of diverse ethnic minorities and hill tribes, unique custom, lifestyle and culture can be observed in the area.

Livelihood of local people centers on the agriculture and husbandry. These two sectors are major mean of income.

Primary source of lighting in Kengtung is candle with 63 % total household. Water fall/rain water is major source for drinking water in the region which shares 39 % of total household. 85% of total household use firewood for cooking. Thus, large number of household in the study area is totally dependent on the firewood for daily cooking activities and on rainwater /water fall for drinking and non-drinking.

Environmental Issue, Environmental Threats and Vulnerability

A number of potential and existing environmental and social effects are expected to occur by existing and planned development projects.

Environmental Impact by Enhancement of Tourism
Increased tourism business in the region will bring both benefit and detrimental effects to the sensitive receivers. A number of existing and potential environmental and social impacts by increasing tourism business have been observed as follows. • Change of traditional lifestyle and culture of local ethnic tribes due to increased communication with outside world • Impact to heritage buildings (minimal) • Increased illegal wildlife and flora species • Solid waste disposal • Surface and underground water quality degradation due to inappropriate sewerage treatment system of hotel , inn and restaurant • Increased access to ecologically sensitive area such as intact forest of hilly area and impact to local flora and fauna • Increased pressure to the social service and existing infrastructure Commodity price change due to increased demand
Environmental Impact by Potential Mining Activities
Surface mining activities are largely associated with various environmental issues if not planned properly in early phase. Significant environmental impacts are • Land grabbing and resettlement issues • Loss of biodiversity and habitat • Surface water pollution • Soil erosion and increased siltation in the stream • Livelihood of ethnic minorities and disappearance of tradition and custom of tribes • Loss of agricultural lands • Affect to cultural tourism through the impact to local customs
Environmental Impact by Waste Management
Improper solid waste management systems could have resulted in a number of detrimental effects on the environment and human in Kengtung. Potential concerns are listed as follows. • Air pollution and health hazard from open burning practices on local residents and workers • Increased hygiene and sanitary issues • More pressure on the existing waste management service

- Blockage to the drain and sewer causing much flooded area and spreading of vectors and forming stagnant water with fouling smell.
- Employees responsible for waste collection and disposal are exposed to harmful substance.
- Presence of fire hazard by flammable and combustible material
- Surface water pollution through direct disposal of and storm run-off

Environmental Impact by Extension of Shifting Cultivation and Other Activities

Deforestation

Deforestation causes loss of ecosystems, loss of flora and fauna species and habitats. Deforestation has been accelerating due to the excess extraction of timber and increasing upland farming. Species such as tiger, bear, and tortoise were threatened by disappearance of their habitats through the extension of cultivated land and plantation.

Soil Erosion

Deforestation is directly linked to the soil erosion, In the absence of trees in area, the valuable top soil layers are washed away with torrential rain flow and increase the sediment load of the receiving river.

Water Pollution

The use of fertilizers and pesticides in agriculture sector in Kengtung continues to rise without proper handling. Increased plantation and active dry farm can damage water quality through run off of agro chemicals into water bodies.

Air Pollution

Air pollution is caused by open burning biomass disposed from land clearance. Conventionally, remaining foliage such as cleared undergrowth, fallen trees, twigs and other debris are piled up and burned it out to make layer of ash which helps the nutrient enriched fertile soil and yield of crop.

Bush Fire

Slash and burn farming is one of the major causes of forest fire. Most of the bush fires originate from burning of vegetation debris. Unattended and uncontrolled burning practice, intense heat and strong wind can lead fires to get out of control and spread.

Key Vulnerabilities of Community and Ecosystem Service

Deforestation by shifting cultivation and illegal logging, firewood harvesting enhances the frequency and intensity of landslide. In some case, landslide cut the transportation route and it takes several days to reopen the road. However, due to the uncontrolled shifting cultivation, widespread hunting and wildlife trade as business, water pollution

by waste disposal and potential mining activities of region, ecosystem service provided are now at risk.

Generic Environmental Management and Recommendation

A series of general recommendations are summarized for government organization, Industry and business, community and civil society as follows.

Recommendations for Government

1. Existing environmental and related regulations and laws highlighted in chapter 2 of this report should be reviewed by local government departments and enforcement measures established including identification of responsible agencies and departments
2. Establish and convene a joint environmental working committee within township and regional level government structures to agree and adopt and implement recommendation made in this report , oversee enforcement of laws and regulations and develop monitoring mechanism to monitor progress in tackling environmental and social issues
3. Promote community environmental awareness campaign highlighting the importance of ecosystem services and its relation to community resilience
4. Township waste management plan should be developed in line with National Waste Management Strategy
5. Increase capacity building of staff from relevant departments for enforcement and implementation of environmental legislations and guidance and inspection and monitoring of environmental performance of business activities through environmental trainings
6. Encourage industry and business to initiate transparency and information disclosure about their activities and service which are likely to impact on environment and community resilience
7. Township departments and regional department should review both TEA impacts section and Community Resilience Assessment Reports produced by World Vision under BRACED to identify climate change and disaster shocks and stresses and further impacts caused by ongoing development activities. Activities identified by communities should be consolidated and plans drawn up for broader processes to enhance the resilience of most vulnerable communities of regions These can include maintenance and improvement of ecosystem service of natural biodiversity by channeling small grants and funds to joint community and government environment and ecosystem management projects
8. Air quality baseline survey in Kengtung urban area should be conducted

Recommendations for Industry and Business

9. Initiate transparency and openness about project and business operations with publication of environmental, health and safety standards and policies.
10. Share information and findings of how businesses activities will affect community services and systems (food, water, energy, health etc.) and their resilience to climate extremes and environment and establish a mitigation plan
11. Encourage business investment in service provision and business practices that will improve the availability of resilience services to communities that will also contribute to economic development and profit margins (e.g agricultural services, community infrastructure, energy and water services etc.)
12. Initiate environmental training program to operatives to ensure the service activities undertaken by business do not adversely affect the resilience of local communities and the environment
13. Corporate Social Responsibility programs should be initiated by development project proponents from mining sectors focusing on enhancement of community resilience, community development , protection of ecosystem service and environmental management

Recommendations for Community and Civil Society

14. Actively participate in stakeholder consultation and business meetings , share local knowledge and experience and express concerns and challenges
15. Understand the role of stakeholders in the EIA process of coal mining and other industry by providing environmental trainings
16. Actively participate in environmental campaigns to be initiated by government organization and other organizations.
17. Develop a private sector oversight mechanism that tracks adherence to environmental laws and procedures of all new development activities and projects
18. Oversee implementation of generic environmental management frameworks and work to encourage accountability and transparency in business and development practices

Introduction and Background

1.1. Background

Myanmar Environmental Institute (MEI) has been commissioned under the Building Resilience and Adaptation against Climate Extremes and Disasters (BRACED) project to conduct Township Environmental Assessments (TEA) for selected townships which are identified as vulnerable to natural disaster and climate change. This study is undertaken as a part of BRACED Alliance Project which has aimed to build resilience of 350,000 people in the selected 8 townships from climate extremes and disasters.

Environmental management and sustainability is one of the fundamental elements of sustainable development. There are many different mechanisms and approaches to achieving environmental sustainability. However, a thorough understanding of the status and condition of the natural environment and plans for developing the built environment is required to be able to analyze environmental impacts and development strategies to maintain and manage our natural environments.

Amongst the tools to achieve this are strategic environmental assessments (SEA) which is a proactive measure to avoid or minimize the environmental consequences of development and other programs.

MEI has identified SEA as an important tool for informing decision making processes and MEI members are striving to establish SEA in Myanmar as an approach recognized and accepted amongst environmental experts and decision makers. MEI recognizes that under Myanmar policy and procedures. SEA should be undertaken by government departments and agencies.

Accordingly, MEI under the BRACED project has classified this study as a Township Environmental Assessment. The study however follows similar steps and methodologies as set out in SEA studies. The TEA studies are focused in eight townships which are considered most vulnerable regions to climate extremes and disasters in Myanmar.

As a part of full BRACED project (2015-2017), MEI has committed to publish 8 TEA reports in Hpa -An, Dagon Myothit (Seikkan), Meiktila, Kyaukphyu, Kengtung, Taungup and Letputta. All reports focus on township level and study the particulars of township plans and economic developments. This document provides recommendations for decision makers to apply in the planning process that incorporate environmental impacts and issues. It furthermore allows for improved awareness of the environment in future planning and policies.

It is anticipated that the information and recommendations provided in this report will be utilized in local level development planning. This data will further help to identify potential environmental changes and impacts on communities that might impact on

capacities or vulnerabilities within communities. It will also be utilized to identify how ecosystem and environmental management can support communities to strengthen resilience to a variety disaster and, climate shocks and stresses. This will indirectly benefit to women and children by supporting resilience building mechanism through its recommendations.

In addition, in line with BRACED's objectives, this document provides general guidance notes and frameworks on how to integrate climate change risk considerations into strategic planning and inclusion of climate adaption and resilience strategy into decision making process as far as possible in the region. Servicing beyond the BRACED project (2015-2017) the contents of this TEA can be regarded as basic environmental reference for future sustainable development activities and would feed into any full SEA undertaken by government departments.

1.2. Introduction of BRACED

The Building Resilience and Adaptation to Climate Extremes and Disaster (BRACED) Myanmar Alliance is a program aiming at strengthening resilience of communities across the country implemented by six consortium partners (Action Aid, Plan International, UN Habitat, Myanmar Environment Institute, World Vision, BBC media Action) with the finical support from Department of International Development (DFID). The three year project from 2015 to 2017 is coordinated by Alliance Coordination Unit based in Yangon.

The principal goal of the project is to build the resilience of 350,000 people across Myanmar to climate extremes through saving lives, protecting livelihoods, improving institutional coordination, and influencing national policy. BRACED alliance is building community resilience to climate extreme events so that vulnerable communities driven women and children are more resilience to identified climate shocks and stresses.

In Kengtung Township, World Vision, the implementing partner and three technical partners including BBC Media Action, UN Habitat and Myanmar Environment Institute are coordinating activities to strengthen resilience. UN Habitat is improving access to climate and weather and risk information through preparation of climate profile of the region and building capacities and skills of township stakeholders to use risk information in planning processes through the development of Township Disaster Management Plan (TDMP). They have additionally conducted township level and national level carpenter trainings to strengthen skills in safer construction.

BBC Media Action undertook research on climate change communication and information access and then produced public service announcements (educational and awareness videos related to disaster preparedness and resilience) broadcast through televisions and radio channels.

World Vision has undertaken community resilience action planning in selected 19 villages in Kengtung. Based on the community risk assessments prepared village communities with supervision of World Vision, identified activities are implemented to strengthen resilience including capacity building trainings, resilience actions plans.

Myanmar Environment Institute (MEI) is working to complement community resilience and institutional support activities by carrying out township environmental assessment in all eight townships. Study looks at the environmental threats posed by existing development projects, sectoral plans, and services to public and business activities and then predict future trends. Based on the finding, MEI prepares generic entry point and recommendations for township environmental management framework and provides trainings to government officials to lead on implementation of TEA recommendations.

Introduction of SEA in Myanmar

Myanmar has recently entered into a transition period from military dictatorship to a democratic governance system with a newly elected government which has been putting efforts in reforming both political and economic structures and policies. At this political juncture, inefficiency of environmental regulatory framework has been posing a critical challenge to the process of strengthening meaningful and effective environmental governance.

Similar to other developing countries, Myanmar has been suffering severe environmental deterioration for decades as a result of poor governance and weak knowledge of environmental issues among the governing bodies, private and public sectors.

Major environmental threats in Myanmar today include widespread deforestation occurring across the country along with water and soil degradation, loss of habitat and destruction of coastal mangrove forest. Many of these ecosystems and resources provide livelihoods and ecosystem services (flood/soil protection, drinking and utility water) to Myanmar's populations in both rural and urban area.

In addition to anthropogenic impacts on these ecosystems and natural resources, the quality, availability and accessibility to these resources and ecosystems may also be significantly affected by changing climate and occurrence of climate extreme events.

To address these concerns in Myanmar, there is an urgent need for government, private and civil society sectors to work together to develop and implement legislative frame work and guidelines which support authorities to prevent further environmental degradation and damages from inappropriate development actions, plan and projects and to identify key proactive measures for development of resilience of natural resources and ecosystems and the people that rely on them for livelihoods and ecosystem services.

In Myanmar, EIA (Environmental Impact Assessment) was introduced in the last few years and is widely practiced in development projects in a number of sectors. After EIA procedure promulgated in December 2015, investment proposals are required to conduct either EIA or IEE.

Being project specific, EIA has some limitations as it does not contribute to higher level decision making. Thus SEA has emerged globally to bridge this gap. While EIA focus on individual projects, SEA aims to provide guidance toward integrating environmental sustainability into higher level planning process and policy choices. In general EIA approach is fairly reactive whilst SEA aims to be more proactive to mainstream environmental consideration into development proposals.

Today, SEA is widely accepted as a high level document that ensures that environmental concerns are taken into account in strategic decision-making in support of sound and sustainable development. In particular, the SEA process assists officials responsible for planning and programming, as well as decision-makers, to take into account these environmental and social dimensions.

The SEA aims to fulfill the requirement of basic environmental guidance for township development activities. SEA will form the basis of a comprehensive environmental governance practice with recommendations that will support environmental governing bodies of the region.

Under the 2015 EIA procedure, SEA is a recognized tool to be carried out by government department on specific projects or development activities and plans.

This TEA report adopts the basic concepts and process of SEA methodology.

1.3. TEA Goal and Objectives

The principal goal of the regional TEA is to provide a regional overview of environmental status in Kengtung that leads to formulation of generic environmental management framework of selected sector that complements resilience building activities. In addition, TEA report is intended to provide guidance to the relevant decision makers to adopt sustainable development strategies in existing and potential plans and programs within the township boundary.

This study is a starting point to advocate for better policy adaptation and to strengthen the capacity of governmental officials and community leaders to understand the correlation between development projects and environmental sustainability.

This document has been designed to meet a number of objectives:

- To analyze the existing environmental and social legislative frameworks relevant to environmental governance,
- To collect environmental baseline information representing physical, ecological and social characteristics of study area,
- To assess and identify significant environmental threats
- To provide legal and technical guidance for sustainable development and entry to environmental management in study township ,

It is anticipated that recommendation and generic environmental management provided in this document shall be practically considered when implementing ongoing

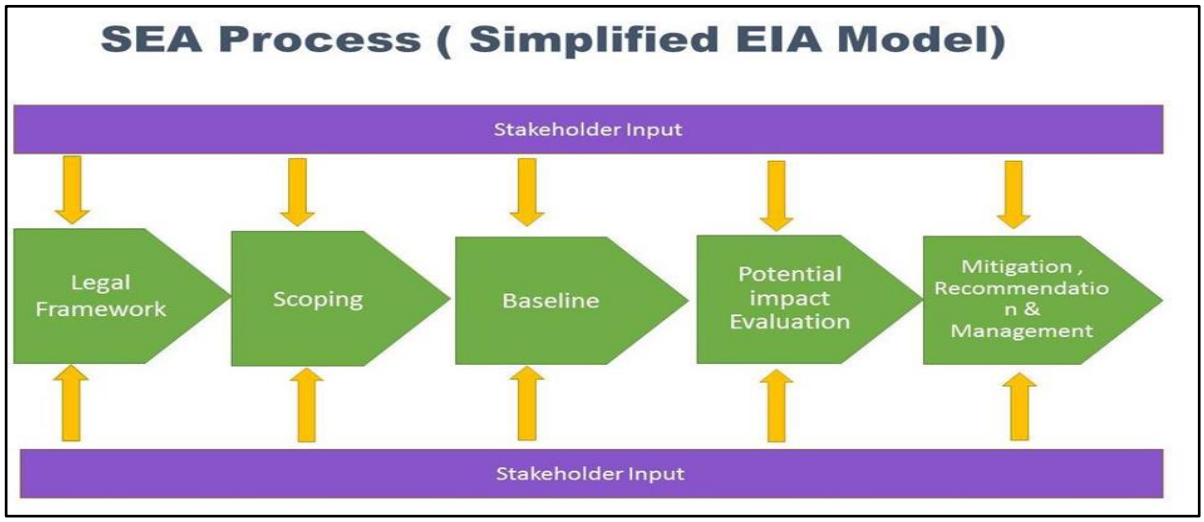
development plan and future potential. The recommendations of the reports will continue to serve beyond BRACED project period.

1.4. SEA Methodology

As mentioned earlier, this TEA study will utilize a broad SEA methodology to undertake analysis of study area. There is no universal methodology for conducting SEA though a great deal of guidance is available for practitioners. A number of attempts have been made to optimize the approach of conducting SEA. Accordingly, MEI has used well-established EIA principle or simplified EIA process in TEA study whilst adapting it to incorporate climate change and disaster risk issues.

The simplified SEA process is shown in following figure.

Figure 1 SEA Process



In this simplified SEA process, stakeholder participation and consultation includes in every step as a continuous participatory approach. All feedback, suggestion and input taken from stakeholder consultations are taken into account in scoping and assessment and mitigation measures.

In this study, the environmental assessment shall be carried out with an emphasis on the sensitivity of receiving elements. Then the TEA will take a broader view of the potential impacts of sectorial plans e.g. tourism sector, waste management and other sectors as well as development projects.

Analysis and evaluation of the probable impact builds on expert judgment technique from the core MEI team validated by a wider variety of opinions and expertise of individuals who have considerable knowledge and skill in environmental related matters.

Data Collection Methodologies

The TEA requires collection of a considerable amount of information including secondary and primary data. To ensure it, following methods were employed to collect information.

Literature Review and Desk Study

The research team firstly reviewed all existing and available technical and scientific documents relevant to the area and other unpublished data other governmental departments and academic institutions.

Field Data Collection

Field observations were conducted to collect primary and secondary data. During the visits, experts from MEI met local governmental officials, some NGOs and local inhabitants.

Stakeholder Consultation and Interview

Stakeholder meeting and focus group meeting were undertaken with various government departments during field survey. Participants and respondents actively discussed and disclosed information about existing activities and concerns about the environmental degradation. .

1.5. Limitations

Major challenge during the study was encountered in the study including a lack of secondary resources and information. Very limited numbers of research and studies on ecology and environmental features of region were published. In addition, the study has centered on easily accessible surrounding areas. In the absence the information or insufficient data, suggestions of stakeholders and expert judgment of individual shall be mainly taken into account for predicting probable impact of the particular subject.

1.6. Environmental Scoping

Preliminary scoping study was conducted through stakeholder consultation meetings and desktop review. Interesting environmental components identified are terrestrial biodiversity and ethnicity. This study, given its mainly environmental focus, could not study all the issues in detail. Thus, it would concentrate on interesting subjects.

The active and potential development plan and activities identified as having negative environmental consequences are described in the following table with linked issues.

Table 1 General Scoping

Development and Activities	Key Environmental Issues
Mining	Pressure on biodiversity , erosion and landslide , endangered

	species , water pollution , , land acquisition,
Waste Management	Air pollution, health and hygiene
Tourism	Waste management , ethnic community
Shifting Cultivation and Other activities	Loss of ecosystem services , biodiversity , Protected Area

Chapter 2. Environmental Legislative Framework & Enabling Environment for Environmental Assessment

2.1. General

Myanmar has already developed legislations and regulations relating to natural environment since before its independence. The Forest Act and the Burma Wildlife Protection Act, for example, was enacted respectively in 1902 and 1936 for the sustainable use of forest products.

2.2. National Environment Policy

National Environment Policy was issued in 1994 by NCEA with intention of formulating sound environmental policies, legislative frameworks, effective utilization of resources and water so as to conserve environment and prevent from degradation .The major theme of policy is consideration of environmental and social aspect into development process. By doing so, it could enhance the quality of life of citizen.

2.3. Myanmar Agenda 21

The commission also formulated a blue print, the Myanmar Agenda 21, in 1997 as a follow up of national environmental policy in response to the call of the Earth Summit to develop national strategies to implement the Global Agenda 21. Myanmar Agenda 21 serves as a framework for integrating environmental considerations in future national development plans as well as sectorial and regional development plans in Myanmar and recognizes the need of environmental impact assessment, integrated economic development and sustainable social development respectively.

2.4. National Sustainable Development Strategy

National Sustainable Development Strategy was formulated to implement the National Environmental Policy in 2009 by Ministry of Forestry with the vision of wellbeing and happiness of Myanmar people. Three overarching goals identified are sustainable management of natural resources; integrated economic development and sustainable social development. In order to achieve these goals, a series of objectives are set along with activities. In addition, leading institution and collaboration institutions are identified to perform the activities.

2.5. Environmental Legislation

Besides the above-stated documents, there are several laws and regulations relating to the environmental matters administered by various relevant ministries in Myanmar. Some major laws and regulations are tabulated with their main purposes in following table.

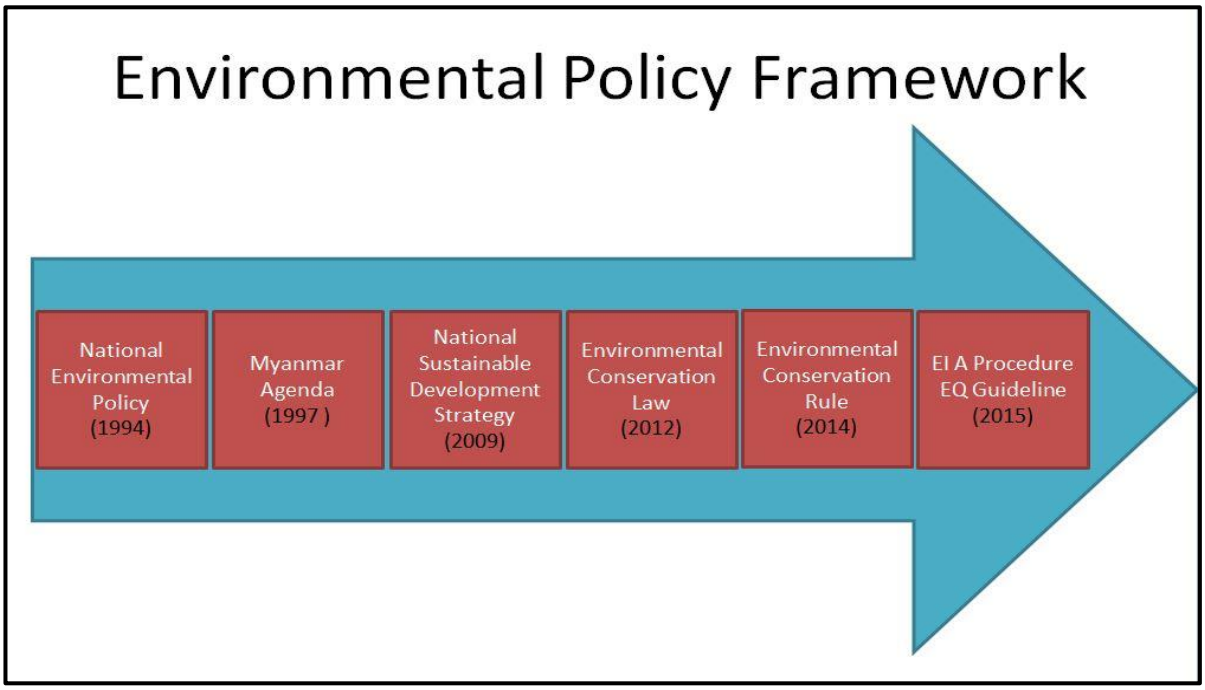
Table 2 Existing Environmental Legislation

Law and regulation	Year	Purpose
Factory Act	1951	To make effective arrangements in every factory for disposal of waste and effluence, and for matters of health, cleanliness and safety.
Public Health Law	1972	To promote and safeguard public health and to take necessary measures in respect of environmental health.
Territorial Sea and Maritime Zone Law	1977	To define and determine the Maritime Zone, Contiguous Zone, Exclusive Economic Zone and Continental Shelf and the right of the Union of Myanmar to exercise general and exclusive jurisdiction over these zones and the Continental Shelf in respect of preservation and protection of the marine environment, its resources and prevention of marine pollution.
Fishing Rights of Foreign Vessels Law	1989	To conserve fisheries and to enable systematic operation in fisheries with participation of foreign investors.
Marine Fisheries Law	1990	To conserve marine fisheries and to enable systematic operation in marine fisheries.
Forestry Law	1992	To implement forest policy and environmental conservation policy, to promote the sector of public cooperation in implementing these policies, to develop the economy of the State, to prevent destruction of forest and biodiversity, to carry out simultaneously conservation of natural forests and establishment of forest plantations and to contribute to the fuel requirements of the country.
National Environmental Policy	1994	To establish sound environment policies in the utilization of water, land, forest, mineral resources and other natural resources in order to conserve the environment and prevent its degradation.
Protection of Wildlife and Wild Plants and	1994	To protect wildlife, wild plants and conserve natural areas, to contribute towards works of natural scientific research, and to establish

Law and regulation	Year	Purpose
Conservation of Natural Areas Law		zoological gardens and botanical gardens
Myanmar Mines Law	1996	To implement mineral resources policy.
Conservation of Water Resources and river law	2006	Protection and maintenance of river bank and river water quality by defining area of river bank and forbidding substance which are harmful
Conservation of Water Resources and River Rule	2006	Specification on role and responsibility for maintaining river, permission process for activities which could damage river resources
Fertilizer Law	2002	To boost development of the agricultural sector, control fertilizer businesses, and to facilitate conservation of soil and the environment.
Environmental Conservation Law	2012	The law lays down the path forward to focus government efforts to accomplish sustainable development and provide basic principle for systematic integration of environmental issues in development mechanism
Environmental Conservation Rule	2014	The rules provide duty and power of Ministry and department, finance for sustainability, development of EIA procedure, guidance for development of environmental standard, urban environment, waste management, protection of natural resource and natural heritage .
EIA Procedure	2015	To provide a clear guidance how to perform environmental impact assessment and initial environmental examination for the development projects
Environmental Effluent Quality Guideline	2015	To inform the specific requirement and standard for discharge and emission

Source: Resource and Environment Myanmar

Figure 2 Existing Environmental Framework



2.6. Institutional Management and Arrangement for Environmental Policy and Strategies

Central Committee for National Environment Conservation and Climate Change (NECC)

Chaired by Vice President of Union of Myanmar, this committee plays a high level coordinating role among the sectorial ministries. Responsibilities of the central committee include lay down policies and mediating the tasks between the Ministries of the Union and Cabinets of the Regions and states. For effective implementation, it has established following committees.

- Policy, Law and Standards Working Committee
- Climate Change Mitigation and Adaptation Working Committee
- Land use and Culture /Heritage Working Committee
- Urban and Industries Working Committee
- Environmental Education Working Committee
- Green Economy Development working Committee

National Coordination Framework

Natural Resource and Environmental Conservation Committees of Pyithu Hluttaw (*Lower house)* and Amyotha Hluttaw(*Upper House)* were formed as part of check and

balance mechanism of Phuhtaungsu Hluttaw. These committees will serve as advisory board to Hluttaw. Responsibilities held by these bodies include gathering information about the widespread environmental issues and complaints from communities and affected people, serving as an advising administrative bodies for more transparent and effective implementation of environmental policy and regulations, reviewing existing legislation and promulgating new natural resource and environmental related legislation.

Ministry of Natural Resources and Environmental Conservation

Since Myanmar has initiated its move towards democracy, the Ministry of Forestry was reformed as Ministry of Environmental Conservation and Forestry (MOECAF) in 2011 as a national level agency to coordinate and handle environmental related issues and matters including the implementation of international environmental agreements signed by government, law enforcements and information dissemination. MOECAF was reformed again by merging with Ministry of Mining as Ministry of Natural Resource and Environmental Conservation (MONREC) effecting from April 1 2016.

Currently MONREC has been acting as focal coordinating body for country's environmental performance and implementation of environmental management.

MONREC has supported preparation of environmental regulations such as EIA rules, environmental quality standards through collaboration with international financial institutions and United Nations organizations. MONREC has been extending it organizational structure by forming sub -divisions under Environmental Conservation Department into State and Division offices and recruiting new staff with the aim of effectively implementing and managing environmental regulations and resources.

Environmental Conservation Department (ECD)

The Environmental Conservation Department (ECD) under MONREC was established in October 11, 2012 to take responsibility for the effective implementation of environmental conservation and management in Myanmar.

Environmental Conservation Department is responsible for implementing National Environmental Policy, strategy, framework, and action plan for the integration of environmental consideration into in the national sustainable development process. Additionally ECD has to manage natural resource conservation and sustainable utilization, pollution control on water, air and land and to cooperate with other government organizations, civil society, private sectors and international organizations concerning with environmental management.

Being a national coordination body related to environmental matters, ECD has been hosting various environmental and sustainable related workshops and meetings in an effort to develop human resource, knowledge and technical expertise in environmental

sector, transferring and encouraging knowledge sharing from international counterparts and experts.

ECD is also responsible for managing the National Climate Change Strategy Development and implementation under the Myanmar Climate Change Alliance.

Regions/States Environment and Climate Change Supervision Committee

With notification, Union Government office gives order to form regional, state and Naypyidaw level, Regional Environmental Conservation and Supervising Committee. The Committee will be chaired by a Council member nominated by the Regional and State Government and the members are nominated by sector ministries and some representatives from CSO. The regional ECD head will act as secretary of committee. The tasks given are[1]

- Implementing Environmental Impact Assessment and establishing comprehensive monitoring for environmental conservation
- Supervising climate change mitigation and adaptation activities and coordination between relevant government department and organizations
- Formulations of plans for conservation of natural resources and cultural heritages
- Issuing directives and supervising activities towards prevention of loss of natural resources and sustainable effective use of them
- Formulation and implementation of plans and directives for sustainability and efficiency of energy use
- Supervision of environmental statistics and database
- Supervision of environmental management of urban, rural, industrial zone and special economic zones
- Supervision of systematic control of waste
- Coordination between relevant government bodies and organizations on environmental disputes
- Inspection and taking action on environmental complaints and if necessary reporting to the Environmental Conservation Committee

2.7. SEA Requirement in EIA Procedure

Newly emerged EIA procedure approved by Union Government in November 2015 and officially launched in December 2015 with support of Asia Development Bank is regarded as significant mile stone for environmental sector of Myanmar .

This procedure focuses on the identification of business types needing EIA and IEE to conduct stakeholder involvement and project transparently.

[1] Need assessment for effective implementation of the environmental conservation law in Myanmar (MOECAF, SYKE, Ministry of Foreign Affair of Finland, UNDP)

Under the Article 123 of section 10[2], SEA requirement is generally stated that MONREC may ask relevant authorities to conduct SEA for policy strategy development plan and program prepared by government organizations of state, regional and township administration, self- administered zone and division or private sector .Where significant environmental and social impact is likely to occur by those policy, strategy, plan and program, MONREC may ask responsible agency for undertaking scoping study to identify and access environmental and social impact, provision of monitoring frame work for those of policy, plan and program.

However, this section does not provide enough details on application and implementation of strategic environmental assessment in decision making process. Reviewing the procedure, it is found to be quite general and does not explicitly stress the requirement of SEA such as TOR, reviewing process, implementation, sense of ownership and follow-up.

Thus it can be concluded that there is not a strong mandatory requirement for conducting SEA.

2.8. Institutional Framework related to Resettlement and Land Acquisition

Principle legislations concerning land acquisition are:

1. Constitution
2. Land Acquisition Act (1894)
3. Farmland Law (2012)
4. Special Economic Zone Law
5. Vacant, Fallow and Virgin Law

Following table presents the existing legislation which governs the land use and land acquisition in Myanmar.

Table 3 Existing legislation related to Land Management

Legislative Framework	Year	Major Provision
Constitution	2008	The Union is the ultimate owner of all lands and all natural resources above and below the ground, above and beneath the water and in the atmosphere in the Union.

[2] 2015 EIA Procedure , Government of Union of Myanmar

Land Acquisition Act	1894	This is basic legal framework for land acquisition providing government to acquire the land from landowner. Major elements include demarcation of boundary, declaration of action and role and responsibility of collectors.
SEZ Law	2014	This law provides framework for forming of working committee, management committee and supporting body with various government department and responsible authority for land acquisition.
Farmland Law	2012	This law focuses on land use right of farmers and details the process of permission to potential farmers who are eligible .Under this law. Land can be sold, leased and transferred freely by legitimate land owner. Role and responsibility of farmland administrative bodies of various levels are defined in detail.
Vacant, Fallow and Virgin Land Law	2012	This law aims at providing framework for effective use of land .Investor can apply land right to the government for basic structure or other investment which would benefit for the sake of state.
National Land Use Policy	2016	This policy was released recently to ensure the systematic land use management and administration of present and future so as to improve food security, water resource development, transportation, business development and to protect environment and cultural heritage.

In connection with land confiscation, little information and guidance is available about streamlining the process of acquiring land in Myanmar. In review of land acquisition act (1894) detailed requirements are not described and followed regulation does not stress the process for the resettlement work. Absences of adequate resettlement and livelihood restoration standards have led to the alleged land grabbing for development project in the past. In recent years, a numbers of protests against the investment projects on account of improper grabbing of land without or little compensation. Government has received piles of complaints over the land grabbing related cases.

Newly promulgated EIA procedure also does not provide the clear guidance and process in dealing with land grabbing, resettlement and compensation. Instead, it merely mentions resettlement is to be carried out in coordination with relevant authorities. Authorized government bodies to be involved in engaging and mediating land issues are not explicitly mentioned.

2.9. Institutional Analysis on Environmental Governance

In review of institutional and organizational management in environmental governance, the responsibly and accountability are still unclear among state and regional department, line ministries, Hluttaw and MONREC.

ECD has been currently increasing staffing to strengthen its capacity to enhance the environmental governance of Myanmar. However, it is observed that there is room for improvement in department such as capacity for monitoring, environmental audit, technical knowledge, skill and experience of staff assigned for the specific duty. In order to fill this gap, international organizations have been continuously delivering capacity building programs including monitoring of water and air pollution, reviewing technique of EIA, IEE and sustainable hydropower to staff of environmental sections of Ministry .

ECD has opened its branches in 14 States and Regions. However, extension of departments into district and township level does not move forward. Lack of township level environmental governing bodies posts key challenges to ECD's performance.

In connection with individual performance and activity, majority of the staff within department are newly recruited with need of skill, knowledge, experience and technical expertise to be developed.

Viewing implementation of legislative framework and environmental policy are not very effective on account of aforementioned factors .Meanwhile ECD has been putting its efforts to improve the department's capacity and capability to address the environmental conflicts and disputes in development projects at both national and regional level.

Township Level Environmental Management

There is no formally organized structure for environmental governance and management in township level during the study period. Sectoral department separately takes responsible for managing environment pertaining to their activity. Whilst forest department monitors the status of deforestation and losses of wildlife, township development committee handles the solid waste management collection and disposal.

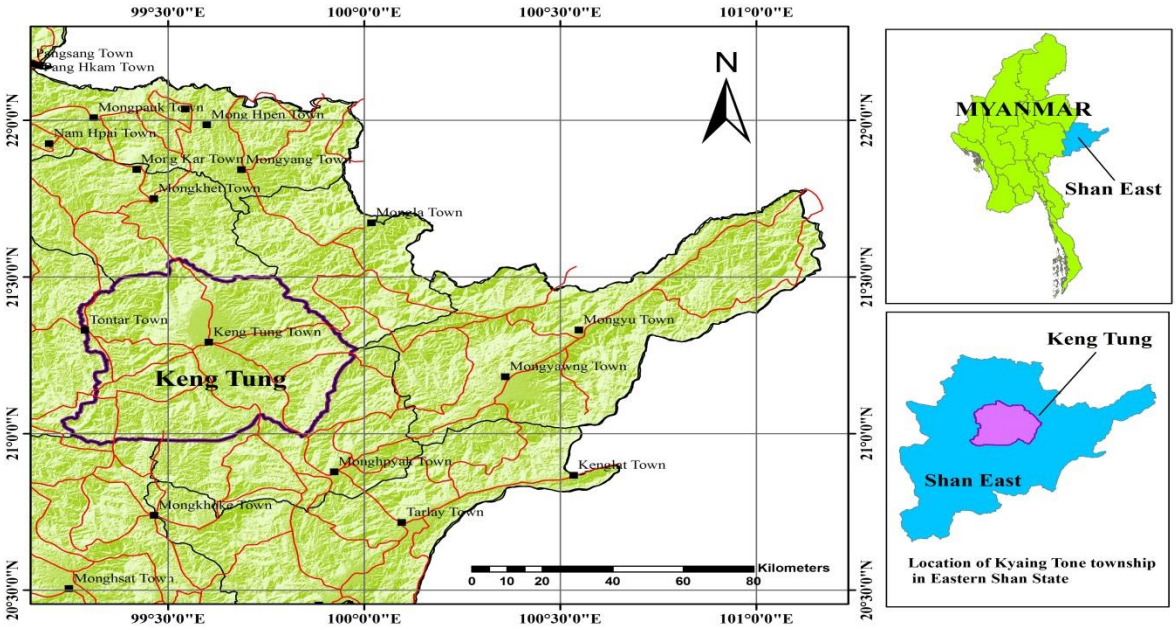
Chapter 3. Environmental Baseline, Key Environmental Issues and Vulnerabilities

3.1. Environmental Baseline

Location

Kengtung is one of the 10 townships in Eastern Shan State, Union of Myanmar on the north by Mingket and Minelar Township(43.4 miles), on the south by Mine Pauk and Mine Sat Township (60.41 miles), on the east by Mine Yaung Township(35.2 miles), on the west by Sub-Tontar Township and Mine Pyin Township(1.50 miles) . The Township has varied landforms with 5,000' and 7,000'above sea level. Southern part of the town is higher than other parts of the town. The total area of Kengtung Township is 3769.122 km² (1460.9 square miles) and Kengtung town is 9.2364 km² (3.58 square miles).The shape of the Kengtung township is compact shape. The region is considered as the most scenic town in the Shan State. It is also administrative town of Kengtung District.

Figure 3 location of Kengtung Township



Relief and Drainage

The land is undulating with low hills. Generally the land slopes towards the north and east, where several streams are draining. The Nark Woke creek flows through the northern part and Nanlatt creek which flows across the north-eastern part which is principally used for the drinking water and irrigation. These two creeks eventually join the Nanlway River which is one of the main tributaries of the Mekong River.

Climatology

All the weather information about the Kengtung described in this section was taken from the Climate Profile study prepared by RIMES under BRACED project.

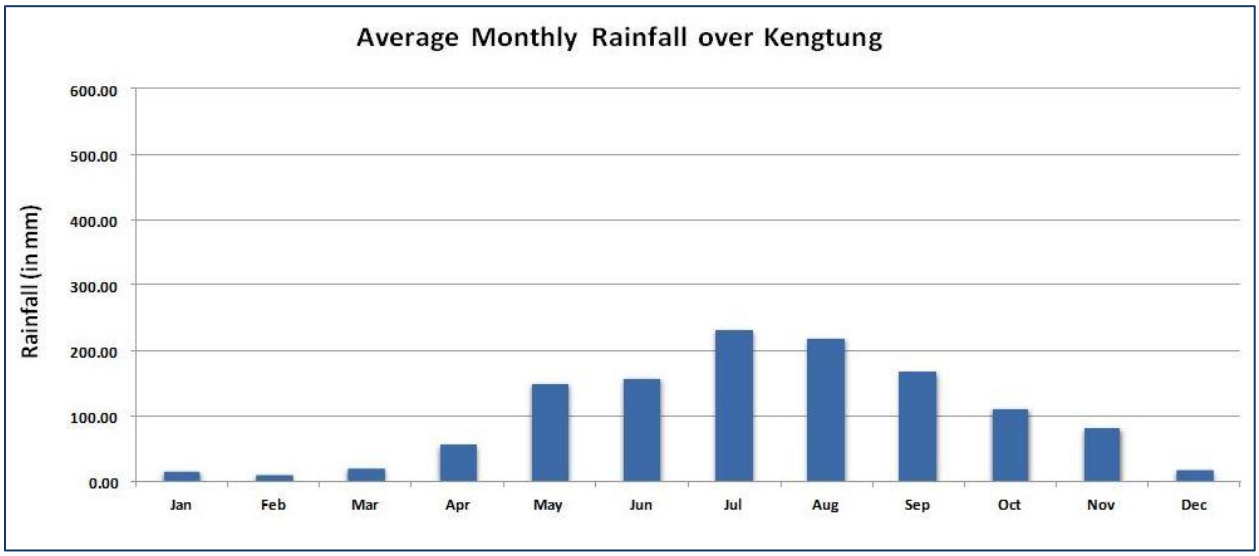
The climate of the study area is controlled by the geographical location, relief and the periodical shifting of monsoon winds. The hottest month in March of the Kengtung Township is 28.3 ºC (83º F). It is coolest in December with 17.5 ºC (63.5 F).

The annual range of temperature is 10.8 ºC (19.5 ºF). The annual mean temperature is 25 ºC (F) with the maximum of 31 ºC (87.8º F) in April and minimum of 17 ºC (62.6º F) in January .

Kengtung has an annual average rainfall of 1232 mm. the rainfall is concentrated during the wet season (May to October), with July and August being the wettest months (receiving 230.80mm and 219.03mm, respectively).

Kengtung receives lesser rainfall compared to townships in the coastal areas, but more rainfall compared to townships in the Central Dry Zone. Located inland, it receives less rainfall from the Southwest Monsoon but benefits from rainfall from remnants of severe weather disturbances from the South China Sea. The average monthly rainfall, in Kengtung, is provided in the following figure.

Figure 4 Monthly Average Rainfall



Source: Climate Profile, RIMES, BRACED Project

The warmest day time temperature is in April (33.5°C). The diurnal variation in April is significant, with its average night time temperature at 17.8°C. The lowest average maximum temperature is in December, at 25.5°C, and January at 27.1°C. Both are also the coolest months in terms of night time temperature (January at 10°C and December at 11°C). February also registers as among the coolest night time temperature averaging at 11.1°C.

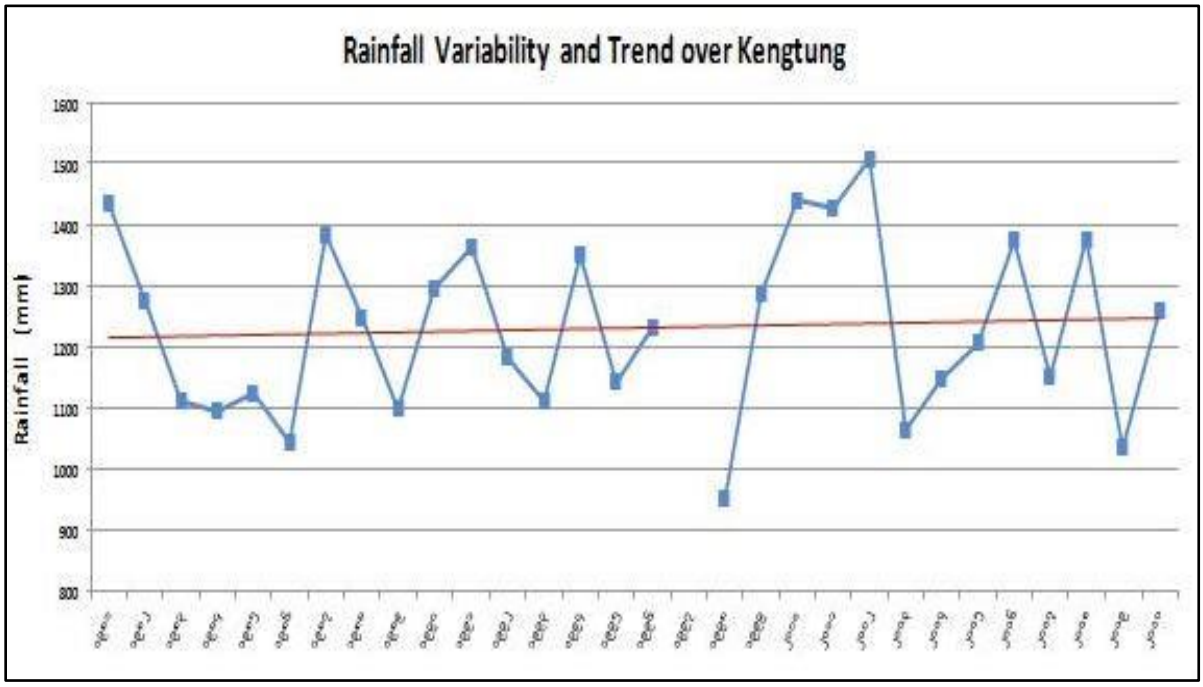
Rainfall Variabilities, Extremes and Trends

Per available data within 30 year from 1980 to 2010, the wettest year was in 2002, which recorded 1507mm of rainfall. On the other hand, 1998 recorded the lowest rainfall of 950mm. Of the available records in 30 years baseline period, the most extreme rainfall events were 108mm, recorded in 16 August 1991.

In Kengtung, while rainfall events of ≥20mm show an increasing trend, while rainfall events of ≥40mm shows a decreasing trend. This indicates the decreasing occurrences of very extreme rainfall.

The wet season rainfall shows an increasing trend, similar to the annual rainfall .The number of rainy days during the wet season, averaging at 87, while highly variable, is showing an increasing trend.

Figure 5 Rainfall Variability and Trend



Source: Climate Profile, RIMES, BRACED Project (Rainfall data from 1995-97 was unavailable)

Temperature Variabilities, Extremes and Trends

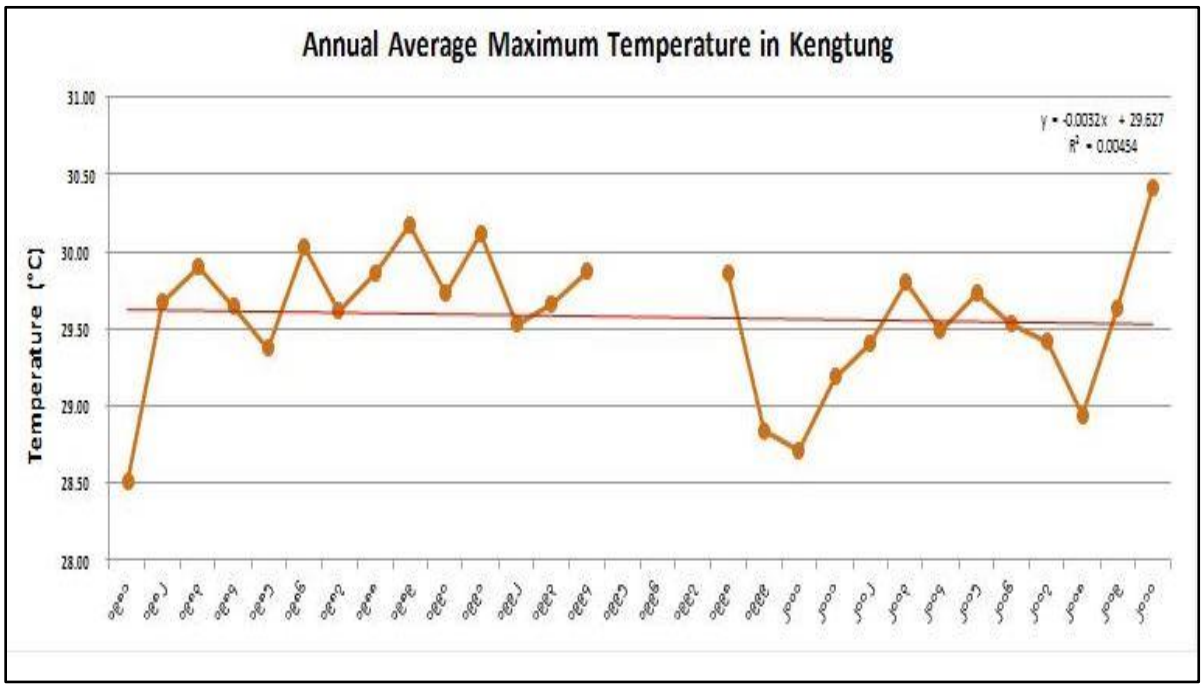
The highest average maximum temperature was in 2010 (30.41°C). On the other hand, the year with the lowest average maximum temperature was in 1981 (28.52°C)

In 30 years, the warmest days were in 18 and 19 April 1983 (40°C; the only two days that exceeded the next warmest temperature of 39.6°C in 15 May 2010)

The annual average maximum temperature shows a decreasing trend; percentile analysis also shows a decreasing trend, which suggests that, the occurrence of very warm day time temperature is decreasing.

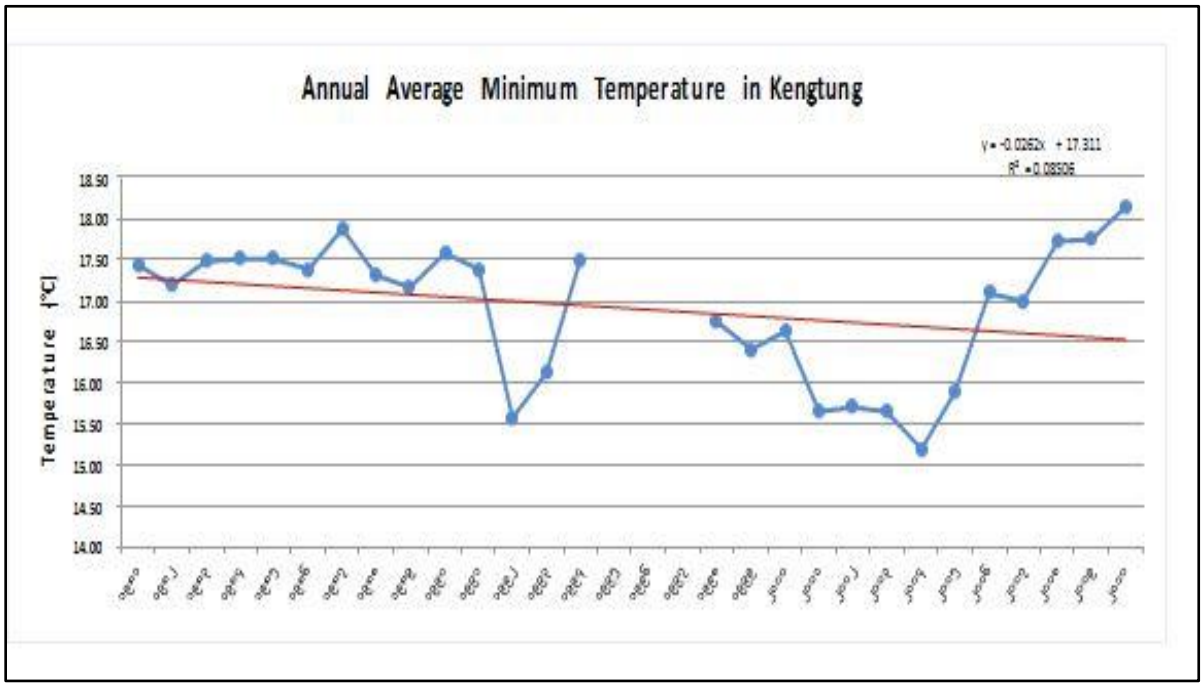
The average minimum temperature, over the 30 years, is 16.91°C. In 2010, 228 nights exceeded the average temperature; 169 nights exceeded 20°C. The warmest night, in 2010, was in 20 May (25.8°C), followed by 22 May (25.5°C).
In 30 years, the warmest night was in 12 June 1992 (29.2°C). About 52% of the nights exceeded the average. The annual average minimum temperature of township shows a decreasing trend.

Figure 6 Annual Average Maximum Temperature in Kengtung



Source: Climate Profile, RIMES, BRACED Project (Temperature data, from 1995-1997, is unavailable)

Figure 7 Annual Average Minimum Temperature



Source: Climate Profile, RIMES, BRACED Project (Temperature data, from 1995-1997, is unavailable)

Geology & Soil

Mainly limestone, latterite and in some places metamorphic rocks occur over the township. Majority of soils found are mountain red brown soils, Brown Forest soils on hilly areas and yellow alluvial soils on flat plains.

Air Quality

Since there is no major industry development in the area, degradation of air quality in the study are is considered insignificant. One of the major causes of air pollution in Kengtung Township is seasonal shifting cultivation and slash and burn. Another source is open burning of municipal solid waste.

Water Quality

Water quality result from Naungtong Lake and other streams in the study area are described in appendix section.

Natural Resource

Mining operations have been practicing in eastern Shan State for long time. Natural resources such as coal, manganese, antimony and zinc are discovered in Shan State. However in the study area, potential resources are coal mining. Two coal mine sites have been earmarked for production. Detailed information about coal mine sites are mentioned in assessment section.

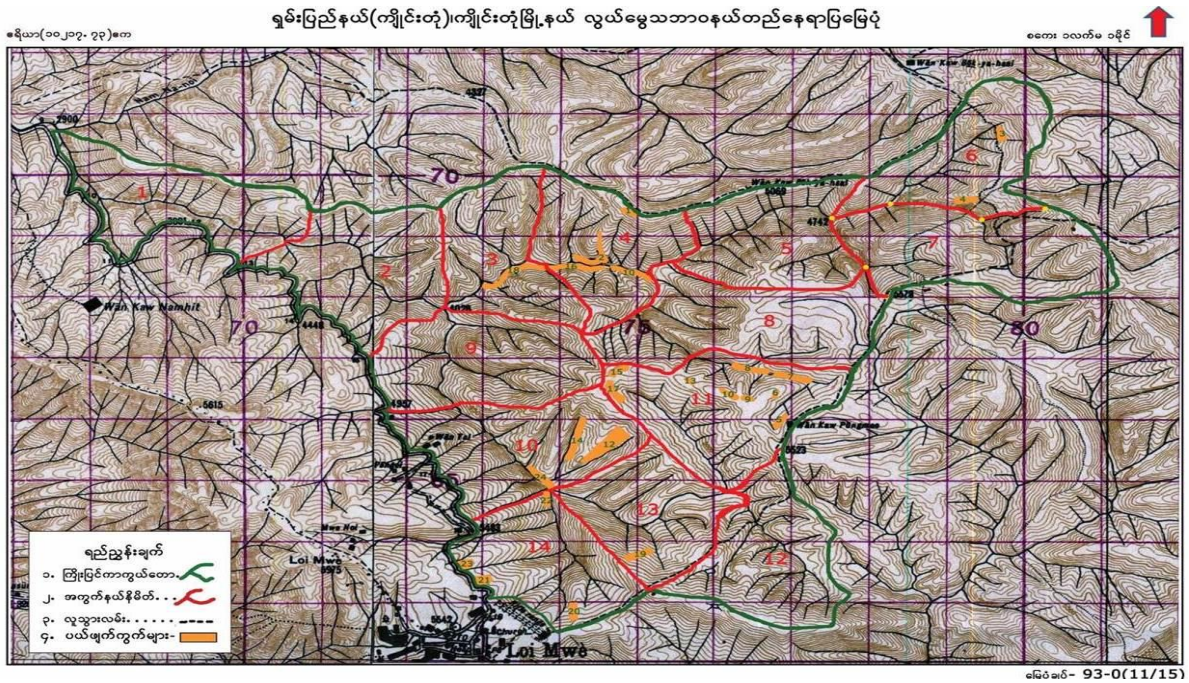
Ecoregion , KBA and Protected Area

The study area falls within ecoregion of Northern Indochina subtropical forests. The amount of protected and unprotected natural habitat remaining is less than 50% but more than 20%. Ecoregion in this category would require restoration to reach Half Protected.[3] Loimwe protected area is categorized as KBA with requirement of additional information.[4]

Loimwe National Park

Loimwe National Park is located to the southeast of Kengtung town. This national park is listed as protected area of Myanmar. The terrestrial protected area was established in 1996 near the hill station with conservation purpose. Some colonial buildings including hill station can be observed around the site. The site is endowed with beautiful mountain scenery and surroundings are inhabited by ethnic tribes. The coverage of protected area is 43 km^2. Dry hill forest type dominates in the area covering 80% of total area. The remaining 20% is covered by pine forest. [5]

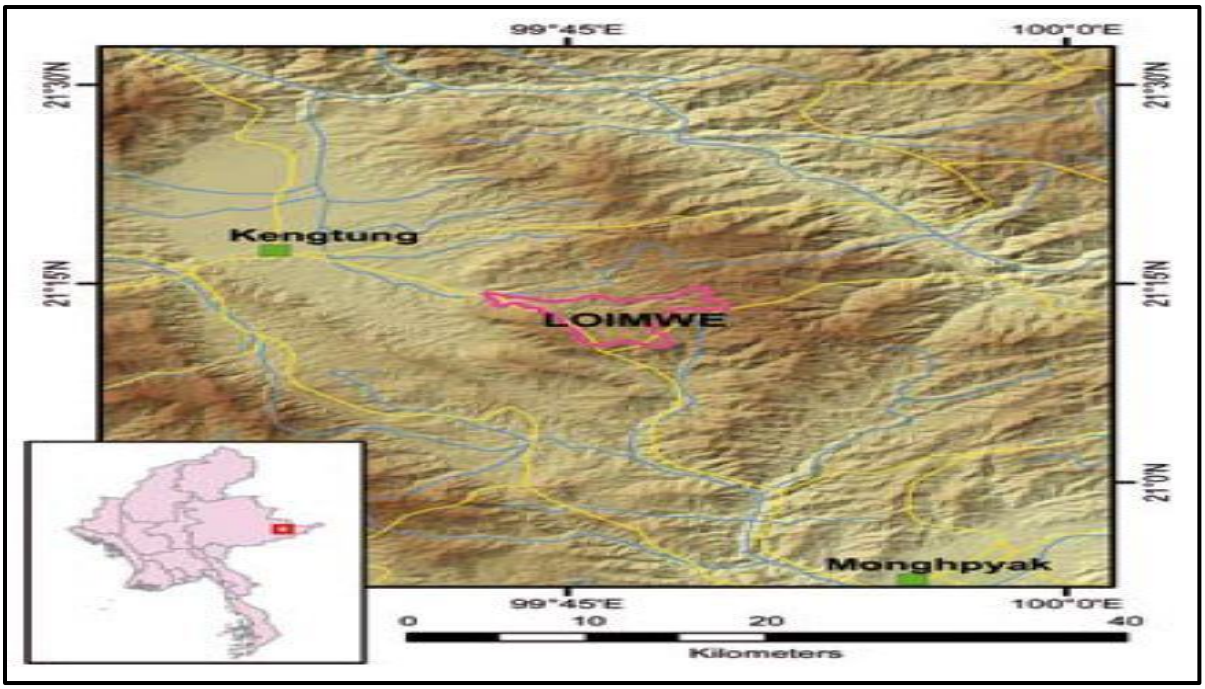
Figure 8 Loimwe Protected Area



Source: Forest Department

[3] https://ecoregions2017.appspot.com
[4] https://myanmarbiodiversity.org/key-biodiversity-areas
[5] Instituto Oikos and BANCA (2011) Myanmar Protected Areas: Context, Current Status and Challenge , Milano, Italy: Ancora, Libri

Figure 9 Loimwe Protected Area



Source: Instituto Oikos and BANCA (2011) Myanmar Protected Areas: Context, Current Status and Challenge , Milano, Italy: Ancora, Libri

This protected area and surroundings are most important terrestrial habitant which features Big-headed Turtle (Endangered) and Yellow Tortoise (Endangered) . [6]

There has been agricultural activities and shifting cultivation in the area . Major environmental challenges in the area are logging , wood harvesting , annual and perennial crop, hunting and collection of terrestrial wildlife and increased shifting cultivation .

Biodiversity

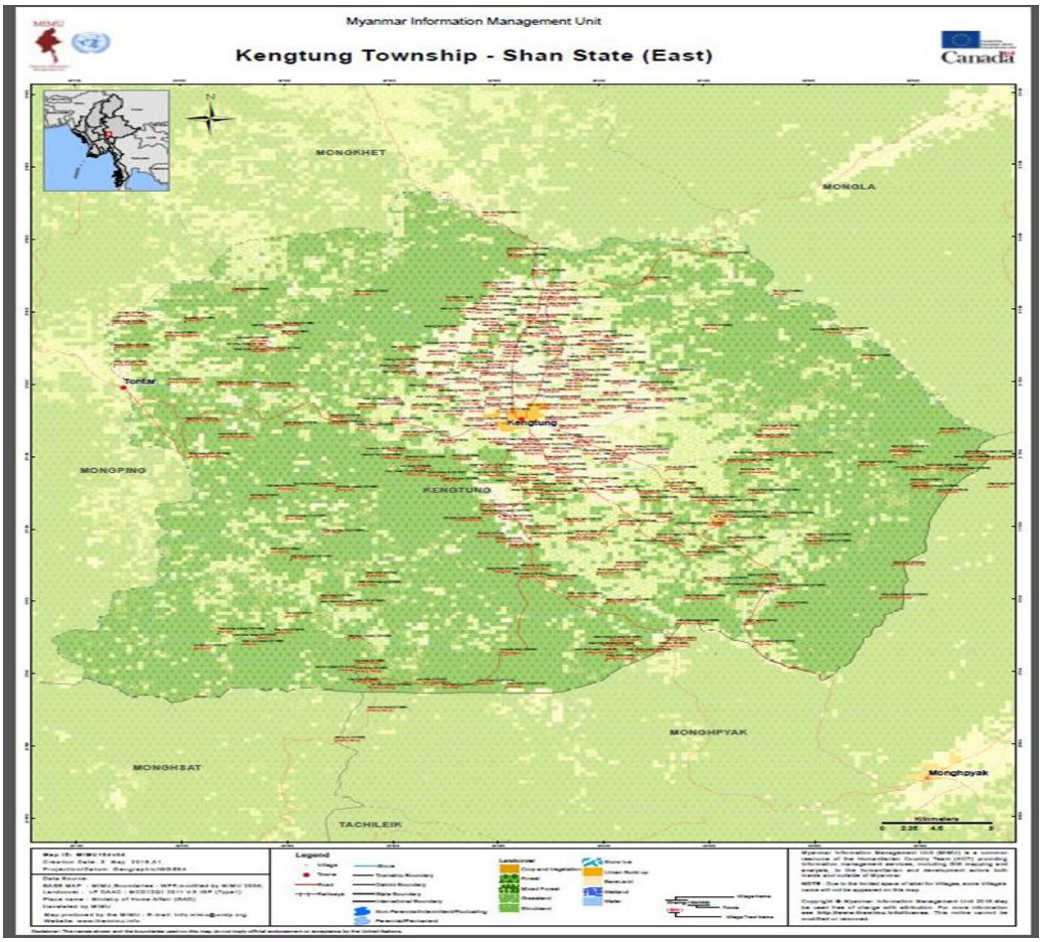
Kengtung town is surrounded by mountainous area . Forest coverage in mountain area is considered high. Most of the forest are type of degraded forest in which canopy is between 10% and 80%. Intact forests are located on the steep mountain range. As habitats, forest, mixed forest , grass land, shrub land , crop and vegetation and urban built up area can be observed. Two urban build up areas are observed in the study are namely Kengtung town and Loimwe town . Large portion of crop land are identified in the low-lying area of Kengtung town .Vegetation coverage with forest, mixed forest , grass land and shrub land can be observed in other parts .

Flora consists of herbs, shrubs, climbers and trees. The prominent trees are conifers, mountain *neem* (taung tamar), oak, walnut and bamboos, *Tamarindus indica L.*(Magyi),

[6] https://myanmarbiodiversity.org/key-biodiversity-areas/

*Oroxylum indicum Vet.(*Kyangsha), *Albizia lebbeckBenth* (Kokko*), Psidium guajava L* (Malaka),*Citrus medica L. var. Lemonum Watt*. (Thanbayo), *minus elengi Roxb* (Khaye) and some medicinal plants. Pine forests which are strictly protected in Myanmar are also discovered in the region.

Figure 10 Habitat of Kengtung



Source: Myanmar Information Management Unit

Wild Life

It is informed that number of wildlife in the region has been notably decreasing due to hunting and wildlife trading. Endangered species in the region are reported as tiger, bear, wild cat , turtle , barking deer and boar.

Wildlife Trading

Mongla and Tachilek , the border towns , have been known as central hubs for wildlife trading doe to their transportation networks . Another illegal wildlife market is Keng Larb, a small town located on the bank of Mekong River. These two townships are bordered with Kengtung. Therefore, illegal wildlife markets are connected with

Kengtung . Consequently, hunting and trading of wild animal have intensified in the area. [7]

The most widely commoditized wildlife animals are snakes, turtle, pangolin, bears, skin of tiger and elephants.

According to Undercurrents Monitoring Development on Burma's Mekong Issue 3, prepared by the Lahu National Development Organization (LNDO) , one villager killed a tiger in Mong Kai village in Kengtung in January 2009. Nowadays, tiger has become almost extinct in the region.

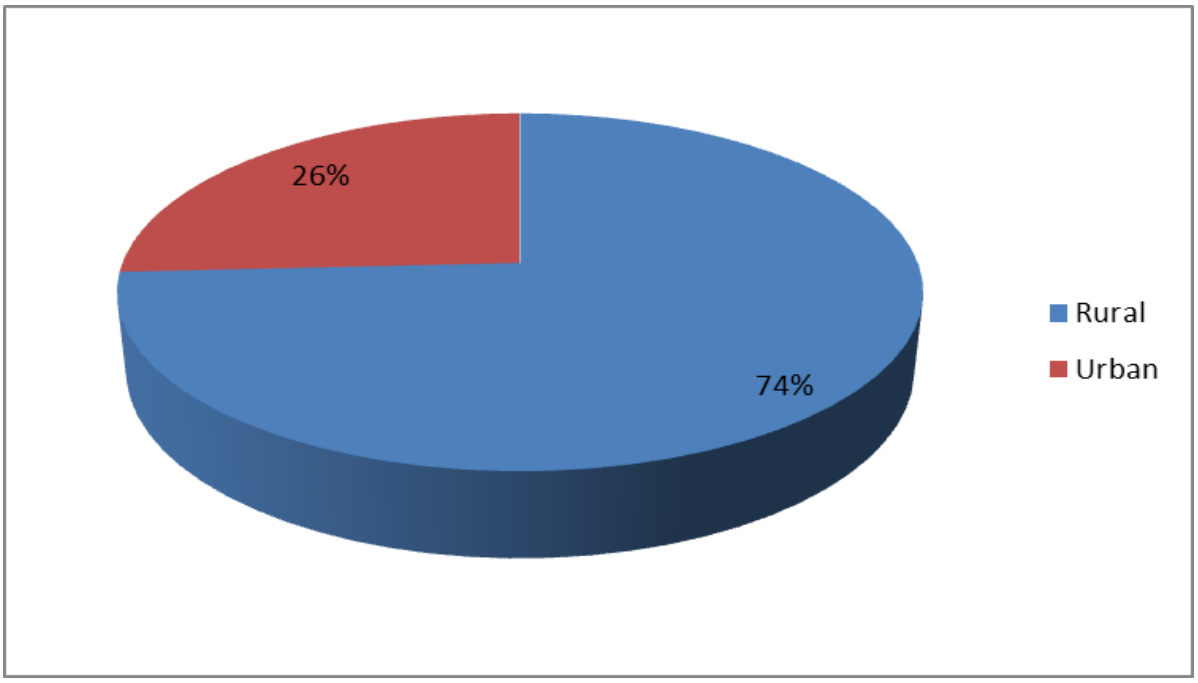
Due to the security concerns, the control on the illegal wildlife trade is ineffective. Located close to border area and prominent wildlife markets have been pressing the fauna status of Kengtung region and other areas.

3.2. Social Setting

Population

According to 2014 Union Census report total population of Kengtung is 171,620 people with 87,779 males and 83 841 females. Total house hold is 34096. Population density of township is 48.95 inh/km² , lower than the country's average population 81.82 inh/km². 74 % of total population lives in rural and 26 % in urban area.

Figure 11 Rural Vs Urban Population



[7] Undercurrents Monitoring Development on Burma's Mekong Issue 3, Lahu National Development Organization (LNDO)

Source: Shan State, 2014 Myanmar Population and Housing , Census Report, Union of Myanmar

Ethnicity, Religion and Culture

Kengtung is home to many ethnic minorities. Akar, Ann (Eng) , Lahu, Loi , Wa , Ta'ang (Palaung) and Tai tribes lives in Kengtung and surrounding hills. Being a center of diverse ethnic minorities and hill tribes, different custom, lifestyle and culture of hill tribes can be observed in the area.

Shan language is primary of spoken language in the study area. Some speak Myanmar language. Languages among these sub-groups are slightly different but they easily communicate each other. Closed to Thai border, some speak Thai language.

Major population is Buddhist and other religions are Christian , Hindu and Muslim. Some tribes still believe in the spirit.

Significant Features and Historic Heritage

Many historic heritages are present in the region. The most prominent ancient and historical vestiges of Kengtung include:

- The old colonial governor's house and an old church in Loimwe
- Naung Tung Lake
- Wat Pha Jao Lung temple
- Dhat Zoam Doi Monastery

Figure 12 Parshan Gate

Health

In Kengtung Township, the majority of rural population still depends largely on indigenous medicines. Kengtung Township has one township general hospital. However, the number of staff is small. The most common diseases among the inhabitants are diarrhea, dysentery, TB and hepatitis. In 2013, Naung Phaung lake overflows its shore and the wastes carried by the flood water are deposited around the low-lying area. The wastes enhance the multiplicity of fly, mosquito, bacteria and virus, resulting in low sanitation condition around the market.

Economic Activities

Livelihood of local people centers on the agriculture and husbandry. These two sectors are major mean of income. Trading and other small businesses also thrive in the area.

Agriculture and Husbandry

The major crops grown within Kengtung Township are cereals, oil-seed crops, garden crops, vegetables and pulses. Rice is major food inhabitants. The most common types are found shifting cultivation and slush and burn. The fishery sector of the Kengtung is not well developed yet . The town is well-known for its fresh fruit and vegetables. Fruit wine such as cherry wine, pineapple wine and strawberry wine are locally made.

Industry

The industrial sector of the study area is not well developed yet and it has no industrial zone. The existing one is agro-based industry, including mostly processing the agricultural products. Among them rice-mills, oil- mills and saw-mills are the most common. Others are purified drinking water, workshop, alcohol liquor mill, lacquered ware, candle, arts and crafts, bamboo, ice factory and tailors. Most of these industries are of small scale run by family members or with a few workers.

Another income for Kengtung is tourism. Closely located to the border with Thailand, the place is easily accessible for the tourist from Thailand side.

Land Use

The area of Kengtung Township is 378,533.198 ha and it is classified as agricultural land, pasture land , industrial land , urban land , rural land ,forestland, cultivable waste land , uncultivable land, reserved and protected unreserved forest land and others.

In 2015-16, 55970.04 hectares of land were used for agriculture which represented about 14.78 percent of the total area of the township. Much of the agricultural land is used primarily for growing paddy. Much of the agricultural land is used primarily for growing paddy.

The forestland occupies 65,045.749 hectares of land sharing 17.18 percent of the township area. The area occupied by uncultivable land in that year was 5812.955 hectares (1.54%) which included pasture land, road land, lake and, streams land and

underwater lands, industrial land, settlement land, religious land and cemetery land. The major crops grown within Kengtung Township are paddy (rainy and summer), groundnuts, sesame, sunflowers, sugarcane, cotton, corn, cereals, oil-seed crops, garden crops, vegetables and pulses.

According to field survey and stakeholder meeting (2016), the study area has net cultivation land of 27985.0202 ha including Le 15294.332 ha , Ya 9920.2429 ha, Garden land 2126.31 ha and highland 644.12ha .

Reserved forests constitute 13860 ha and unreserved forests cover 17034.54 ha in Kengtung Township.

Community Forestry is the one kind of forest establishment and conservation by the local community. There are 15 groups of community forestry in Kengtung Township.

Unless proper remedial measures are immediately taken, these forests will soon disappear. If concerted efforts are not taken to conserve the remaining forests, it is very much likely to disappear in the next years.

Source of Lighting

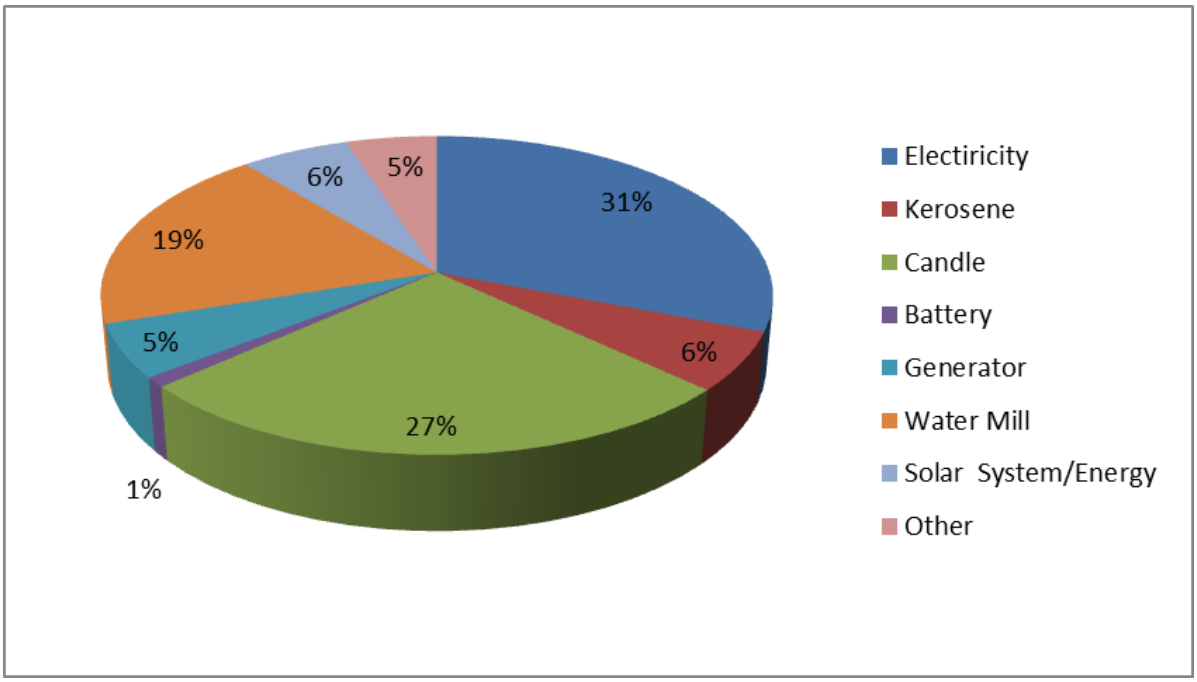
Primary source of lighting in Kengtung is candle with 63 % total household account for. 21% of household use electricity for lighting. Being a mountainous area with abundance of water availability from natural streams, electricity generation from water mill also plays important role in the study are with 19 %of total household.

Table 4 Source of Lighting

Electricity	Kerosene	Candle	Battery	Generator	Water Mill	Solar System/Energy	Other
10532	2051	9054	338	1859	6497	2048	1717

Source: Shan State, 2014 Myanmar Population and Housing, Census Report, Union of Myanmar

Figure 13 Source of Lighting



Source of Cooking

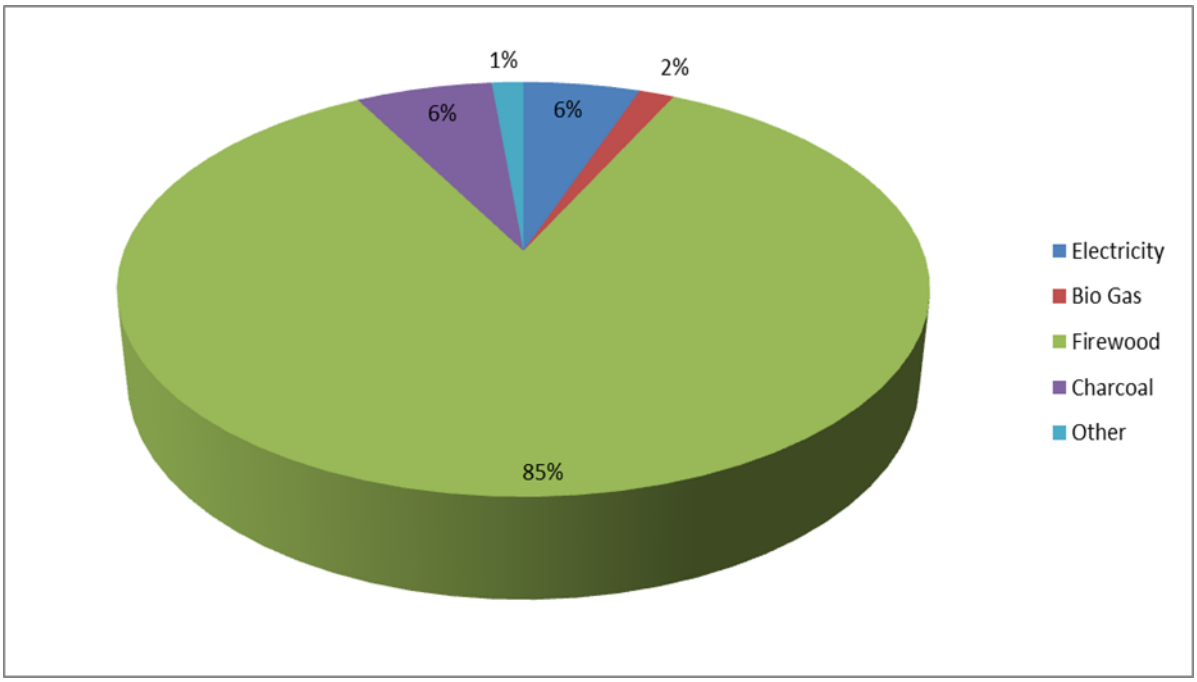
In Kengtung, 85% of total household use firewood for cooking. Thus, large number of household in the study area is totally dependent on the firewood for daily cooking activities. Consequently, notable amount of firewood from nearby forest area would be collected. Some households use charcoal, electricity and bio gas in cooking but it is not much significant.

Table 5 Source of Cooking

Total HH	Electricity	Bio Gas	Firewood	Charcoal	Other
34096	1894	573	28898	2217	514

Source: Shan State, 2014 Myanmar Population and Housing , Census Report, Union of Myanmar

Figure 14 Source of Cooking



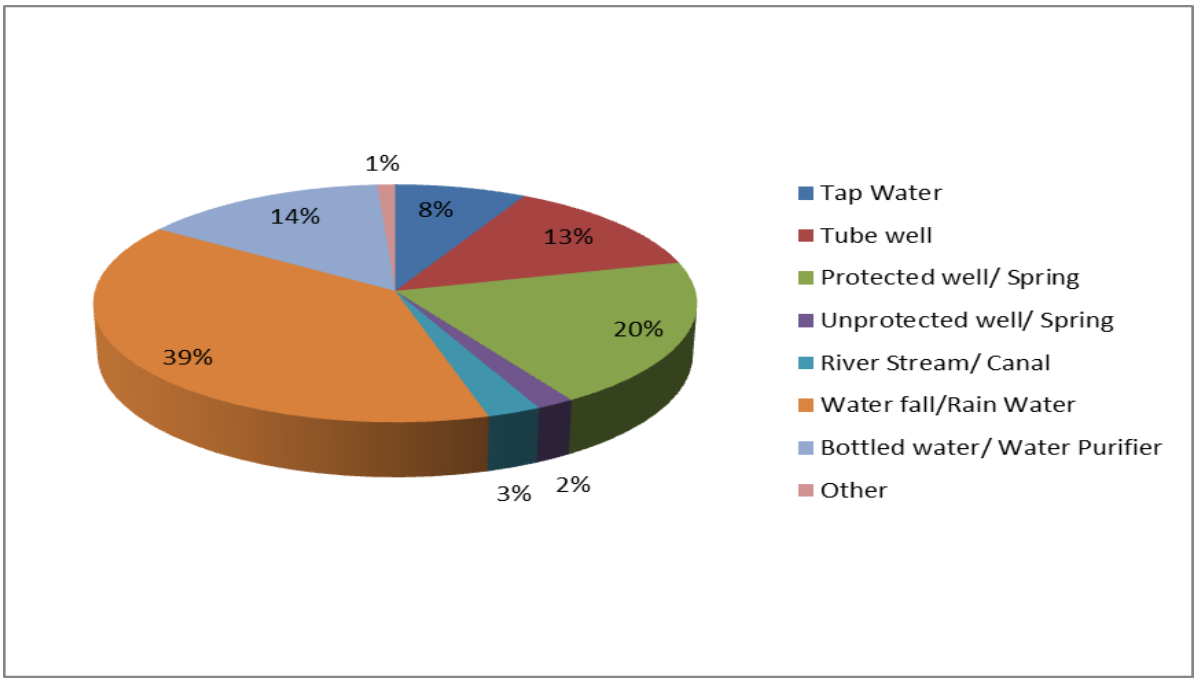
Source of Drinking Water

Water fall/rain water is major source for drinking water in the region which shares 39 % of total household. Some household uses protected well/ spring which accounts for 20% . Other drinking water sources are bottled water(14%) , tube well water (13%), tap water (8%) , river/canal water (3%) and unprotected well/ spring (2%) .

Tap Water	Tube well	Protected well/ Spring	Unprotected well/ Spring	River Stream/ Canal	Water fall/Rain Water	Bottled water/ Water Purifier	Other
2656	4512	6816	629	892	13262	4974	355

Source: Shan State, 2014 Myanmar Population and Housing, Census Report, Union of Myanmar

Figure 15 Source of Drinking Water



Source of Non Drinking Water

Similar to drinking water source, water fall/ rain water plays major role as a non-drinking water source for local communities which account for 39% of total household. Protected well/spring is another importance source on which 23 % of total household depend on for non-drinking purpose.

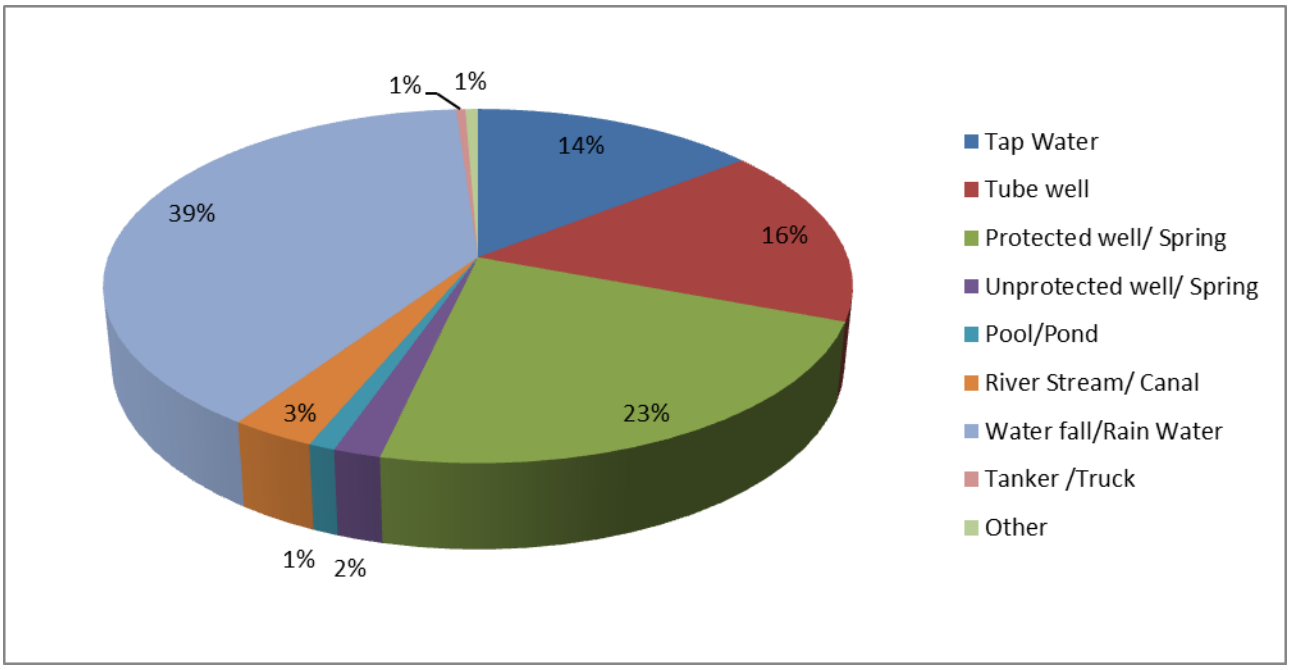
Since study area is mountainous region with significant number of natural water sources such as spring, stream and waterfall, these sources are important for localized electricity generation, drinking and utility water.

Table 6 Non-Drinking Water Source

Tap Water	Tube well	Protected well/ Spring	Unprotected well/ Spring	Pool/Pond	River Stream / Canal	Water fall/Rain Water	Tanker /Truck	Other
4908	5573	7786	600	339	1072	13445	156	217

Source: Shan State, 2014 Myanmar Population and Housing, Census Report, Union of Myanmar

Figure 16 Non-Drinking Water Source



3.3. Environmental Issues and Analysis

Environmental Impact by Enhancement of Tourism

As mentioned in the baseline section, Kengtung is endowed with unique natural environment, interesting cultural heritage sites, colonial remains, colorful dresses and diversity of ethnic mountain tribes and enchanting mountainous landscapes. Besides, it is close to famous Golden Triangle, and other border areas with Thailand and China. Trekking to the hill tribe villages, enjoying mountain scenery, observing colorful market and visiting colonial buildings in protected area are major hotspots and activities of tourism industry of Kengtung.

With combinations of various attractions, Kengtung has become one of the tourist destinations of eastern Shan State in Myanmar. Principle type of tourism in Kengtung is cultural tourism (trekking to tribe villages).

Table 7 Tourism and Environmental Impact

Element	Description
Current and Future Trend	Number of tourists visiting the area is not significant in these days. Since this is one of opportunities being an unspoiled unique custom and lifestyles of ethnic tribes, cultural tourism (ethnic minority) would continue to thrive in the future. Along with influx of tourists from various routes, demand for infrastructure will be increased.
Environmental Impact	Increased tourism business in the region will bring both benefit to community and detrimental effect to the sensitive receivers. A number of existing and potential environmental and social impacts by tourism business have been observed as follows. • Change of traditional lifestyle and culture of local ethnic tribes due to increased communication with outside world • Impact to heritage buildings (minimal) • Increased illegal wildlife and flora species • Solid waste disposal • Surface and underground water quality degradation due to inappropriate sewerage treatment system of hotel , inn and restaurant • Increased access to ecologically sensitive area such as intact forest of hilly area and impact to local flora and fauna • Increased pressure to the social service and existing infrastructure • Commodity price change due to increased demand
Climate Change and linkage Impact	Thriving tourism business would bring the better income for local communities through various means. Increased income diversification can support the building of resilience of local community against natural disasters. One of major activities of supporting resilience of the region is through well-structured

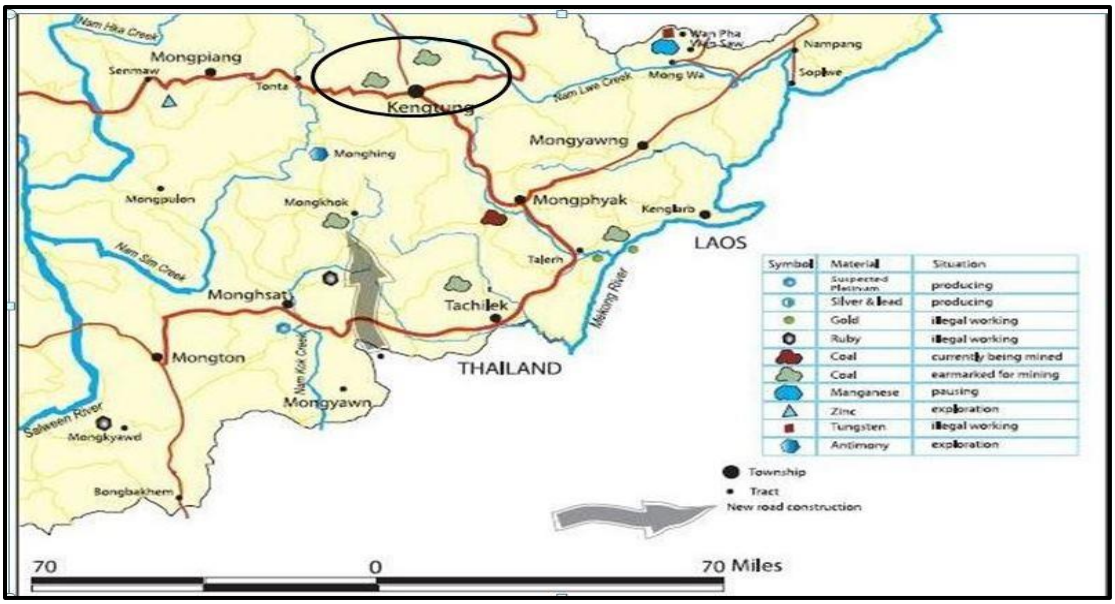
	accommodation, food security.
Recommendation	• Enforcement of existing environmental regulation • Hotel, Restaurant and inns should be installed waste water treatment system • Careful selection of location for construction of road, accommodation and other facilities related to tourism sectors away from sensitive area • Localized tourism strategy to be developed harmonizing environmental sustainability , economic growth and social value of region • Development of code of conduct for tour operator, accommodation provider and local guide for preservation of natural heritage and prolonged local custom • Enhance the awareness about the value of historic heritages , cultural heritages and traditional custom of local ethnic people • Ensure all tourists well understand the norms prior to visiting the local tribe villages. • Requirement to maintain the traditional lifestyles and customs of the tribes • Renovation and maintenance program of cultural heritage buildings

Environmental Impact by Potential Mining Activities

Similar to other area, Eastern Shan State has been a place for mining activities. Primary mineral resources identified in the area are in the form of mineral fuel and metal such as gold , antimony , manganese, and coal . However, only the coal is commercially feasible mineral resource discovered in Kengtung. Small scale gold panning performed by individual or with family members can be observed along the some streams. There have been two coal mining sites earmarked in Kengtung Township.[8] One site is located to the northwest of Kengtung and other to the north east. Both sites are away from the Loimwe National Park which is located to the south of Kengtung town.

[8] Undercurrents , Monitoring Development on Burma's Mekong Issue 3, the Lahu National Development Organization (LNDO) , April 2009

Figure 17 Earmarked Coal Mine Sites



Source: Undercurrents , Monitoring Development on Burma's Mekong Issue 3, the Lahu National Development Organization (LNDO) , April 2009.

Mining can significantly develop the erosion issues which the region frequently encounters. Opening mining involves the removal of topsoil layer and vegetation cover. As consequence, sediment load would be brought down to river stream leading to water pollution and flooding.

Deforestation and loss of flora and fauna are one of the major concerns associated with mining activities. The existing environmental and social status of potential mining sites remains unknown. Therefore, only the key environmental impact expected to be are described in the following table.

Table 8 Coal Mining and Environmental Impact

Element	Description
Current and Future Trend	Information about the illegal coal mining activities in the region is observed through secondary source. With high potential of coal prospect, the mining activities in the region will be taking place.
Environmental Impact	Surface mining activities are largely associated with various environmental issues if not planned properly in early phase. Significant environmental impacts are • Land grabbing and resettlement issues • Loss of biodiversity and habitat • Surface water pollution • Soil erosion and siltation in the stream • Livelihood of ethnic minorities and disappearance of tradition

	and custom of tribes • Loss of agricultural lands • Affect to cultural tourism through the impact to local customs
Climate Change and Linkage Impact	One of the major impacts by surface mining is soil erosion. A significant volume of sediment would be brought down by torrential rain into the downstream if adequate silt control system is not employed. More siltation load is expected to be increased .Consequently; the situation would intensify the flood.
Recommendation	• Compliance to the existing environmental regulation for environmental management and pollution control • Transparency and total information disclosure about the mining work to help local community understand the consequence of those activities • Mine design should be drawn based on environmental sustainability • Avoidance to the land acquisition and resettlement as much as possible • Top soil management is considered one of major components of EIA process • Landscaping the mined area with local flora to be followed in used mine area • High level of grievance mechanism should be established for the mining related work • water pollution and air pollution control with minimum water use • Environmental training programs to be tailored for effective implementation of Mine EMP

Environmental Impact by Waste Management

Similar to other cities, Kengtung has been struggling to tackle the challenge in waste management sector. The designated damping site is located to the western part of the town.

Responsibility and accountability for managing and operating waste disposal site rest with Town Development Committee and service providers. There are 5 wards in Kengtung Town. Disposed of variety of waste generated in Kengtung town are transported to the dumping site (along embankment and 100′ depths and 2.5 acres width of canyons) a using conventional truck on a twice a day basis.

Solid wastes are burnt out at the dumping site. Harmful toxic known as dioxin is emitted by burning plastic containing organochlor based compound such as PVC (Poly Vinyl Chloride). The practice of burning waste is the major driver of localized air pollution in the area.

According to World Bank estimation, annual waste generation per capita in Myanmar is 0.44 kg/capita/day[9]. Based on given waste generation rate and population of Kengtung urban area of 44,289 people, it is roughly estimated that the urban area has been generating about 19 metric tons on a daily basis. The entire township (both urban and rural) could generate the municipal solid waste up to 75.5 metric tons per day in rough estimation. All waste generated from urban area could not be transported to the dumping sites due to insufficient capacity , resources and improper waste disposal practices by people.

Figure 18 Existing Waste Dumping Practice

In rural area, there is no waste collection and disposal service provided by government authorities. Instead, villagers have to manage waste disposal on their own which means burning, burying, and discarding nearby water course and on the roadsides. Unhygienic opening waste dumps could be spotted on the roadside in the vicinity of villages.

Due to the various factors such as lack of capacity to handle waste management, insufficient equipment, human resource, institutional arrangement, enforcement of regulations and governance, solid waste management in Kengtung Township has been struggling.

[9] Quick Study on Waste Management in Myanmar – Drafted (Current Situation and Key Challenges) 2016

Table 9 Waste Management and Environmental Impact

Element	Description
Current and Future Trend	It is expected that population will be steadily increased tourism industry will be one of the major business in the region and consumption pattern of people remain same, waste generation is considered to be high in the future.
Environmental Impact	Improper solid waste management systems could have resulted in a number of detrimental effects on the environment and human in Kengtung. Potential concerns are listed as follows. • Air pollution and health hazard from open burning practices on local residents and workers • Increased hygiene and sanitary issues • More pressure on the existing waste management service • Blockage to the drain and sewer causing much flooded area and spreading of vectors and forming stagnant water with fouling smell. • Employees responsible for waste collection and disposal are exposed to harmful substance. • Presence of fire hazard by flammable and combustible material • Surface water pollution through direct disposal of and storm run-off
Climate Change and Linkage Impact	Uncollected debris could remain in the drain and make blockage to the water flow. This blockage could worsen the intensity of flood in rainy season. Open burning is one of the sources of air pollutants by adding more greenhouse gases into atmosphere.
Recommendation	Increased volume of waste can be considered potential resources for human consumption and utilization. In general, waste for potential resource could be utilized through following options. • To develop a township waste management plan led by township development committee with assistance of waste management specialists. The proposed solid waste management plan should be in line with national waste management strategy. • Uncontrolled waste disposal in public and reduce , reuse and recycling should be promoted through public environmental campaigns • Delivering proper water management trainings including safe

Element	Description
	handling of waste, disposal method to the field employees • Promoting effective waste management and disposal practice among public through initiating public and school campaign • Provide personal protective equipment to the basic workers who are dealing with waste collection and transportation • Strategy for waste management in rural area • Feasibility study of small-scale compositing plant in Kengtung and villages area. • Fencing the open dumping and burning area to avoid contact with public

Environmental Impact by Extension of Shifting Cultivation and Other Activities

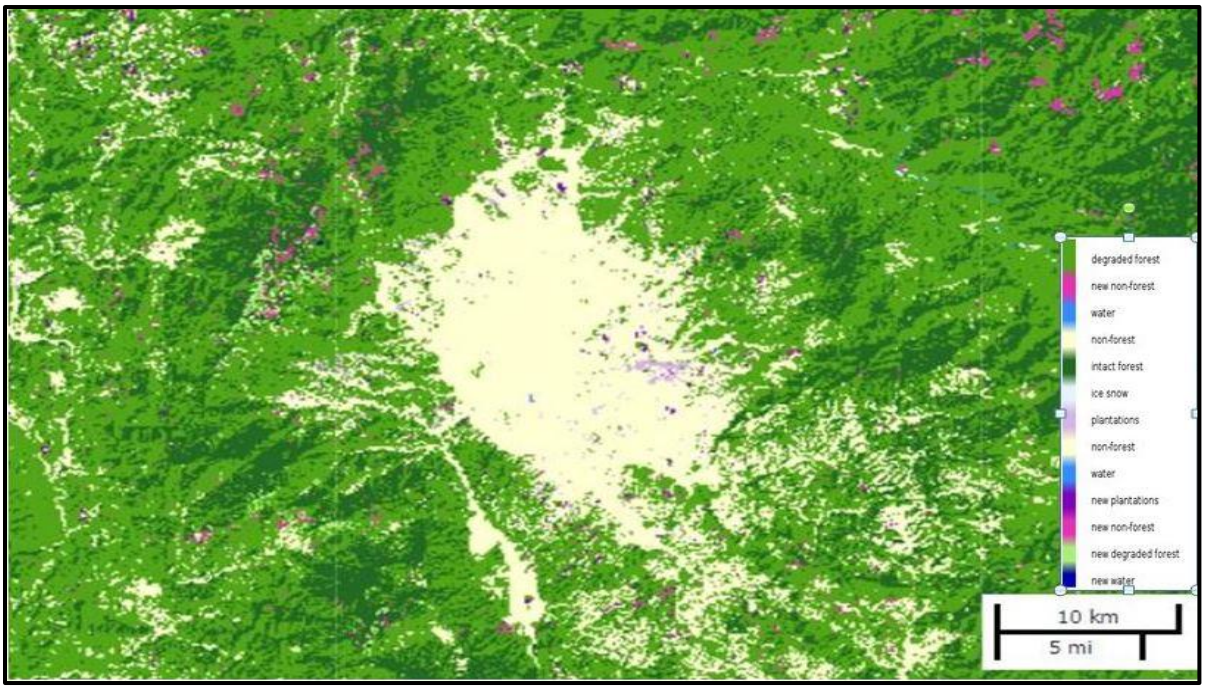
In ecological perspective, ecosystems in the region have been significantly degraded and forest coverage has been largely reduced due to the prolonged history of human settlement and increased shifting cultivation. The land form of this area is predominantly occupied by mixture of high and medium hill range covering forest, shrub land, and woodland and cultivation land. One of the major factors that caused adverse environmental consequences is clearance of vegetation for upland cultivation. Slash and burn of forest and woodland is widely practiced in the area for reclamation of new dry farm land.

The large scale deforestation of forests in the Kengtung area in the past several decades was mainly due to overcutting and slush and burn. Being poor and lack of alternative jobs and no access electricity, the majority of the local inhabitants depend heavily on the shifting cultivation for their survival. The income obtained from the shift cultivation spent for food, clothing, shelter, education, health and social formalities.

Overcutting for firewood and charcoal production, the extension of paddy land area and clearing of plots for shifting cultivation. The demand for fuel heightened with the increasing population since electricity cannot cover much of area .Only certain wards and government departments received electricity round the clock.

The depletion of forests is accompanied by biodiversity extinction and loss of habitats, changes of ecological system, enhancement of climatic extremes, increased frequency of drought, heavy rain and storm, land slide, flood, severe soil erosion, decline of air and water quality, increasing hazard to aquatic animals and erosion of mountainous area. The mountainous dwellers witnessed loss of life having no forests barrier to withstand the wind, rain and accompanied by the powerful landslides.

Figure 19: 2002-2014 Myanmar Forest Cover Change (Kengtung Area)



Source: Myanmar 2002-2014 Forest Cover Change Developed by: ALARM, Smithsonian Institution, GMAP and American Museum of Natural History

According to the figure, distribution of patches of new non-forest and plantation has been observed in some area within Kengtung Township from 2002 to 2014. . Hilly range in the northwestern part of Kengtung town is spotted to be the highest area of newly developed non-forest. However, in comparison with other areas of Shan State, extent of land cover change in the study area is relatively low.

Figure 20 Vegetation Burning

Figure 21 Terraced Agriculture Patches

Rural communities significantly rely on firewood for cooking purpose. Annual firewood harvesting by 85% of total household is considerable volume of firewood. Consequently, degradation of forest coverage is unavoidably happening.

Table 10 Shifting Cultivation, Human Activities and Environmental Impact

Element	Description
Current and Future Trend	Little is known about the spatial extent of plantation and expansion of agricultural land and its trends. Nonetheless, extension of agricultural land, firewood collection and timber extraction are considered increasing due to the demand and lack of infrastructure such as electricity which lead to deforestation and extinction of endangered terrestrial fauna and flora species.
Environmental Impact	*Deforestation* Deforestation causes loss of ecosystems, loss of flora and fauna species and habitats. Deforestation has been accelerating due to the excess extraction of timber and increasing upland farming. Species such as tiger, bear, and tortoise were threatened by disappearance of their habitats through the extension of cultivated land and plantation. *Soil Erosion* Deforestation is directly linked to the soil erosion, In the absence of trees in area, the valuable top soil layers are washed away with torrential rain flow and increase the sediment load of the receiving river. *Water Pollution* The use of fertilizers and pesticides in agriculture sector in Kengtung continues to rise without proper handling. Increased plantation and active dry farm can damage water quality through run off of agro chemicals into water bodies. *Air Pollution* Air pollution is caused by open burning biomass disposed from land clearance. Conventionally, remaining foliage such as cleared undergrowth, fallen trees, twigs and other debris are piled up and burned it out to make layer of ash which helps the nutrient enriched fertile soil and yield of crop. *Bush Fire* Slash and burn farming is one of the major causes of forest fire. Most of the bush fires originate from burning of vegetation debris. Unattended and uncontrolled burning practice, intense heat and strong wind can lead fires to get out of control and spread.

Element	Description
	Social Environment Forest whether pristine or degraded in nature, serves the local community providing fruit, vegetable, fish, herbal medicine, honey and other NTFP(Non Timber Forest Product) on a daily basis . Loss of forest coverage poses a serious threat to food security of farming communities since forest provides basic food and income to locals. In addition, area without top soil and vegetation coverage are prone to potential landslide.
Climate Change and Linkage Impact	One of the driving factors of climate change is deforestation and land use change. Forest is a natural carbon sink which absorbs carbon and emit oxygen which is vital for living of human being and animals. Open burning directly brings about the climate change by sending carbon dioxide and methane which are regarded as most harmful global warming gases into the atmosphere. On the other hand, deforestation induced by vegetation clearance is responsible of degrading the resilience of nature and biodiversity. Forest also plays an important role in watershed management and can prevent landslides and floods through maintaining soil stability and ground water flow. Forests are essential in flood protection and climate change adaptation through ecosystem services.
Recommendation	The land cover change between 2002 and 2014 in Kengtung area is detected to be minimal compared to other areas in Shan State. However, in order to maintain the sustainable ecosystem, following suggestions are made. • Principle of compensation for chopping down tree should be introduced regionally. The principle is grounded on the fact that number of chopped down trees shall be replanted in the similar habitant. • Implementation of government's policy on logging activities should be continuously followed. These measures could be achieved through cooperation of local community involvement. • Monitoring illegal logging and tree cutting should be programmed. • Slash and burning practices should be stopped through

Element	Description
	legal enforcement, awareness campaign and capacity building which will make local community understand the consequence of slash and burn practices. • To understand the existing biological status of region, government should encourage organization to conduct the flora and fauna baseline survey of region. • Awareness raising program about illegal trading of endangered flora and fauna species • Encourage establishment of community forest for firewood and other basic requirement • Program of firewood substitute • More incentive for community forest

3.4. Key Vulnerabilities of Community and Ecosystem Service

Major environmental threats and vulnerability in Kengtung

A number of environmental threats triggered by potential and existing development plans and human interventions have been addressed and general assessment has been made on individual source. Amongst environmental threats, disappearance of wildlife, forest degradation and resettlement are considered most significant in the township area.

According to community resilience assessment reports prepared by project village communities of Kengtung under the supervision of World Vision in BRACED Project, major natural disaster encountered in the region by rural communities are high wind, flood, land slide and intense heats. As consequences of these disasters communities frequently suffers from waste scarcity and damage to the agricultural land.

Flood and Land Slide

Due to the heavy rain, flooding and land slide frequently occurs in the study area. Community residing along the stream suffers severely the consequence of flood. Flooding has become seasonal disaster in the study area. Due to combination of climate change with more rain, increased sedimentation load brought down from upstream increases the intensity of river flood. Large volume of sediment load from potential mining sites could act as a blockage to the stream flow and consequently more intense flooding is expected .

As consequent land slide also takes place with the heavy rain. Deforestation by shifting cultivation and illegal logging, firewood harvesting enhances the frequency and

intensity of landslide. In some case, landslide cut the transportation route and it takes several days to reopen the road.

Food

Major food is rice. Agricultural business is major income source for the livelihood of people. Some people depend on hunting and beekeeping. Other crops such as fruit, tea leaf , maize, and tomatoes are grown . Increased natural disasters such as flood and landslide largely impacts on the food security of local communities through damage to agricultural land and decrease in crop production.

Ecosystem Service

Ecosystem service is various services provided by natural ecosystem to human. Ecosystem service is generally divided into four categories namely provisioning service, regulating service, supporting service and cultural service.[10]

Habitat of the study area is categorized into urban built-up area, agricultural land, shrub land and large area of damaged and intact forest. Major ecosystem provided by the region is drinking and utility water sources and bodies, herbal medicine, fruits and various non- timber forest product and firewood.

However, due to the uncontrolled shifting cultivation, widespread hunting and wildlife trade as business, water pollution by waste disposal and potential mining activities of region, ecosystem service provided are now at risk.

Water Scarcity, Availability and Quality

The inhabitants of the study area suffer the intense heat in the summer resulting in water scarcity. Waterfall /rainwater is primary source of drinking in the region. Other reliable sources of drinking water are protected well and spring. Urban inhabitants are affordable to use bottled water for drinking. However, village communities rely on natural sources for drinking.

Due to the long history of shifting cultivation, tree cutting and logging, deforestation has been accelerating in the region. Consequently, disappearance of water sources such as water fall and stream can be temporary frequent in summer or lower water supply from those source. Unethical disposal of garbage into the water body decrease the water quality and could make the water unfit for both drinking and utility purpose.

Table 11 Identified Key Vulnerable Communities by Environmental Impact

Development and Human Activities	Impact	Affect	Vulnerable Community

[10] https://en.wikipedia.org/wiki/Ecosystem_services

Waste Management	Depredation of surface and ground d water quality Drainage block, Fire	Health, Aquatic life Accelerate flood, spread of disease Urban and village community	Community used dug well and water pond Village community Factor owner and
Shifting Cultivation	Reduction of forest coverage , disappearance of wild species	Ecosystem service Disappearance of water source Impact to the protected area, and natural landscape,	Farmer, village communities ,
Mining	Loss of vegetation, Water quality Increased sedimentation	Ecosystem service Increased flood intensity	Village communities.
Tourism	Cultural heritage and traditional custom Waste disposal	Interruption to local custom Pressure to existing service	Ethnic Minorities Urban resident

Chapter 4. Generic Environmental Management and Recommendation

This chapter sets out to consolidate all if the data in this report by presenting a series of recommended actions and deliver a mechanism for relevant authorities to undertake to manage the environment matters and to reduce environmental risk. The implementation of these recommendations will contribute to protection of environment and sustaining livelihood as well as building resilience of local communities.

The study team stresses the requirement to be carried out in a manner which will lead to harmonization of environment, economy and social values of Kengtung Township Recommendations provided in this section center around the future and existing service, human activities and development projects that are deemed to have significant environmental impacts in the township. It is acknowledged that no all recommendations and actions can be implemented immediately. It is intended that the detailed implementation plan will be developed as part of the township implementation consultation process.

It is the responsibility of government agencies to take into consideration and integrate of these management measures into the existing activities and future activities. Prior to any new activities, consultation with local affected communities is considered a must.

As this document is just an advisory document to government, allocation of the responsibility and accountability is excluded.

Recommendations should be considered as dynamic and revision will be taken place as required based on implementation results on the ground.

Institutional Arrangement

Environmental Conservation Department of Regional Government, General Administration Department, Township Development Committee, Forest Department and other relevant agencies hold responsibility as implementing agencies for ensuring that all development and sectorial programs are operating with environmentally, socially and ethically responsible principles and adherence to the stipulated legislation and guidance.

Strengthening of institutional capacity

Environmental management and governance is new area for the government employees working in environmental related sectors. Existing capacity of departments of various administrative levels of government such as township, district, region and state and central bodies is currently weak. Accordingly, much more efforts are needed to enhance the capacity of individual, organization and institution as a whole.

General Recommendation for Major Actors

A series of recommendations is summarized for government organization, Industry and business, community and civil society as follows.

Recommendations for Government

1. Existing environmental and related regulations and laws highlighted in chapter 2 of this report should be reviewed by local government departments and enforcement measures established including identification of responsible agencies and departments
2. Establish and convene a joint environmental working committee within township and regional level government structures to agree and adopt and implement recommendation made in this report , oversee enforcement of laws and regulations and develop monitoring mechanism to monitor progress in tackling environmental and social issues
3. Promote community environmental awareness campaign highlighting the importance of ecosystem services and its relation to community resilience
4. Township waste management plan should be developed in line with National Waste Management Strategy
5. Increase capacity building of staff from relevant departments for enforcement and implementation of environmental legislations and guidance and inspection and monitoring of environmental performance of business activities through environmental trainings
6. Encourage industry and business to initiate transparency and information disclosure about their activities and service which are likely to impact on environment and community resilience
7. Township departments and regional department should review both TEA impacts section and Community Resilience Assessment Reports produced by World Vision under BRACED to identify climate change and disaster shocks and stresses and further impacts caused by ongoing development activities. Activities identified by communities should be consolidated and plans drawn up for broader processes to enhance the resilience of most vulnerable communities of regions These can include maintenance and improvement of ecosystem service of natural biodiversity by channeling small grants and funds to joint community and government environment and ecosystem management projects
8. Air quality baseline survey in Kengtung urban area should be conducted

Recommendations for Industry and Business

9. Initiate transparency and openness about project and business operations with publication of environmental, health and safety standards and policies.
10. Share information and findings of how businesses activities will affect community services and systems (food, water, energy, health etc.) and their resilience to climate extremes and environment and establish a mitigation plan
11. Encourage business investment in service provision and business practices that will improve the availability of resilience services to communities that will also contribute to economic development and profit margins (e.g agricultural services, community infrastructure, energy and water services etc.)

12. Initiate environmental training program to operatives to ensure the service activities undertaken by business do not adversely affect the resilience of local communities and the environment
13. Corporate Social Responsibility programs should be initiated development project proponents such as mining sector focusing on enhancement of community resilience, community development , protection of ecosystem service and environmental management

Recommendations for Community and Civil Society

14. Actively participate in stakeholder consultation and business meetings , share local knowledge and experience and express concerns and challenges
15. Understand the role of stakeholders in the EIA process of coal mining and other industry by providing environmental trainings
16. Actively participate in environmental campaigns to be initiated by government organization and other organizations.
17. Develop a private sector oversight mechanism that tracks adherence to environmental laws and procedures of all new development activities and projects
18. Oversee implementation of generic environmental management frameworks and work to encourage accountability and transparency in business and development practices

Generic Recommendation in Environmental Management

Sr.	Environmental Category	Recommendation	Benefit to Environment,,Climate Change Adaptation and Resilience
1. Thriving Tourism Sector in Kengtung			
1A	Management	➢ Enforcement of existing environmental regulation ➢ Careful selection of location for construction of road, accommodation and other facilities related to tourism sectors away from sensitive area ➢ Localized tourism strategy to be developed harmonizing environmental sustainability , economic growth and social value ➢ Development of code of conduct for tour operator, accommodation provider and local guide for preservation of natural heritage and ethnic customs ➢ Ensure all tourists well understand the norms prior to visiting the local tribe villages	Improve Institutional Framework Protection of adverse impact on environmental and social element in early phase
1B	Water Pollution	➢ Hotel, Restaurant and inns should be installed waste water treatment system	Reduction harm to local water body
1C	Capacity Development	➢ Enhance the awareness about the value of historic heritages , cultural heritages and traditional custom of local ethnic people	Value cultural heritages
2. Potential Mining Activities			
2 A	Management	➢ Compliance to the existing environmental regulation for management and pollution control ➢ Transparency and total information disclosure about the mining work to help local community understand the consequence of those activities ➢ Mine design should be drawn based on environmental sustainability ➢ Top soil management is considered one of major components of EIA process	Improve infrastructure Understand the level of impact by industry on community and enable to take

Sr.	Environmental Category	Recommendation	Benefit to Environment,,Climate Change Adaptation and Resilience
		➢ Landscaping the mined area with local flora to be followed in used mine area ➢ High level of grievance mechanism should be established for the mining related work	additional measure
2B	Water and Air Quality	➢ water pollution and air pollution control with minimum water use	Prevention of water pollution
2C	Livelihood	➢ Avoidance to the land acquisition and resettlement as much as possible	Avoidance of adverse livelihood change
2D	Capacity Building	➢ Environmental training programs to be tailored for effective implementation of Mine EMP	Reduce harm to environment
3.Waste Management			
3A	Management	➢ Recommendation to develop a township waste management plan led by township development committee with assistance of waste management specialists. The proposed solid waste management plan should be in line with national waste management strategy. ➢ Strategy for waste management in rural area ➢ Feasibility study of small-scale compositing plant in Kengtung and rural area. ➢ Improving existing drainage network through regular clean up	Reduce flooding caused by improper waste disposal Reduce health risk
3B	Capacity Building	➢ Uncontrolled waste disposal in public and reuse and recycling should be promoted through public environmental campaigns and with incentives ➢ Promoting effective waste management and disposal practice among public through initiating public and school campaign ➢ Delivering proper water management trainings including safe handling of waste, segregation , disposal method to the field employees	Increase perception on waste management and reduce harm

Sr.	Environmental Category	Recommendation	Benefit to Environment,,Climate Change Adaptation and Resilience
3C	Health and Safety	➢ Provide personal protective equipment to the basic workers who are dealing with waste collection and transportation ➢ Fencing the open dumping and burning area to avoid contact with public	Reduce harm to employee and public
4. Extension of Shifting Cultivation and Other Activities			
4 A	Management	➢ Implementation of government's policy on logging activities should be continuously followed. These measures could be achieved through local community involvement. ➢ Monitoring illegal logging and tree cutting should be programmed. ➢ Slash and burning practices should be stopped through legal enforcement, awareness campaign and capacity building which will make local community understand the consequence of slash and burn practices. ➢ To understand the existing biological status of region, government should encourage organization to conduct the flora and fauna baseline survey of region. ➢ Principle of compensation for chopping down tree should be introduced regionally. The principle is grounded on the fact that number of chopped down trees shall be replanted in the similar habitant	Restoration and maintain biodiversity and ecosystem service Compliance to legal requirements
4 B	Capacity Building	➢ Awareness raising program about illegal trading of endangered flora and fauna species	Reduction of illegal trading on wildlife and flora species
5. Climate Change and Ecosystem Management			

Sr.	Environmental Category	Recommendation	Benefit to Environment,,Climate Change Adaptation and Resilience
5 A	General	➢ Promote environmental awareness campaign in community highlighting the importance of ecosystem services and its relation to community resilience and climate change ➢ Review both Community Resilience Assessment Reports produced under BRACED to identify climate change and disaster shocks and stresses and further impacts caused by ongoing development activities. ➢ Enhance the resilience of most vulnerable communities of Kengtung through maintenance and improvement of the good ecosystem service of natural biodiversity by channeling small grants and funds to joint community and government environment and ecosystem management projects.	Improve ecosystem service Improve community resilience

Reference

1. Climate Profile (Climate Variabilities, Extremes and Trends in Central Dry, Coastal and Hilly Zones) Myanmar by RIMES
2. Community Risk Assessments , Kengtung Township, World Vision
3. 2015 EIA Procedure , Government of Union of Myanmar
4. Forest Department
5. Instituto Oikos and BANCA (2011) Myanmar Protected Areas: Context, Current Status and Challenge , Milano, Italy: Ancora, Libri
6. Kengtung Map ,Myanmar Information Management Unit
7. Morphological Study on Some Fishes in Kengtung Envions , Term Paper (Unpublished) Department of Zoology , University of Keng tung
8. Myanmar 2002-2014 Forest Cover Change Developed by: ALARM, Smithsonian Institution, GMAP and American Museum of Natural History
9. Nang Aung Kham and etal.,( )Geographical Study on Urban Land Use of Tachileik Town, Kengtung University Research Journal,Vol.3, Department of Geography, University of Kengtung
10. Need assessment for effective implementation of the environmental conservation law in Myanmar (MOECAF, SYKE, Ministry of Foreign Affair of Finland, UNDP)
11. Shan State, 2014 Myanmar Population and Housing , Census Report, Union of Myanmar
12. Son Thai, Daw & etal., (2013):Geographical Assessment of Paddy Cultivation in Kengtung Township, Kengtung University Research Journal ,Department of Geo Term Paper : (2013) A Geographic Analysis on Transportation of Eastern Shan State, Term Paper (Unpublished) Department of Geography, University of Kengtung.
13. Term Paper:(2013) Morphological Study on Some Fishes in Kengtung Envions ,Term Paper (Unpublished) Department of Zoology , University of Kengtung.
14. Term Paper: (2013) Urban Land Use in Tachileik Town (Unpublished) Department of Geography, University of Kengtung.
15. Town Record.,(2016) Report on Regional Data (Kengtung), Township Administration
16. Thai, Daw & etal., (2013):Geographical Assessment of Paddy Cultivation in Kengtung Township, Kengtung University Research Journal ,Department of Geography, University of Kengtung
17. Quick Study on Waste Management in Myanmar – Drafted (Current Situation and Key Challenges) 2016
18. Undercurrents , Monitoring Development on Burma's Mekong Issue 3, the Lahu National Development Organization (LNDO) , April 2009.
19. https://ecoregions2017.appspot.com/
20. http://geonode.themimu.info/layers/geonode%3Amyanmar_forestcoverchange
21. https://myanmarbiodiversity.org/key-biodiversity-areas/

22. https://myanmarbiodiversity.org/key-biodiversity-areas/
23. https://en.wikipedia.org/wiki/Ecosystem_services
24. ကျိုင်းတုံမြို့ ရှမ်းပြည်နယ် (အရှေ့ပိုင်း) ၏ ၂၀၁၁-၂၀၁၂ ဘဏ္ဍာနှစ်မှ ၂၀၁၅-၂၀၁၆ဘဏ္ဍာနှစ် အထိလူမှုစီးပွားဖွံ့ဖြိုးတိုးတက်မှု (၂၀၁၃ ခုနှစ်၊ စက်တင်ဘာလ)
25. သဘာဝဘေးသင့်ဒေသများအားကူညီထောက်ပံ့ထောက်ပံ့ရေးကော်မတီ၏ လုပ်ငန်းဆောင်ရွက်မှု အစီရင်ခံစာ (ကျိုင်းတုံမြို့၊ ကျိုင်းတုံခရိုင်၊ ရှမ်းပြည်နယ် (အရှေ့ပိုင်း)) (၂၀၁၅ ခုနှစ်၊ နိုဝင်ဘာလ)
26. (El Nino) အယ်နီညို အကျိုးသက်ရောက်မှုကြောင့် ဖြစ်ပေါ်လာနိုင်သည့် အခြေအနေများအပေါ် တုန့်ပြန် ဆောင်ရွက်နိုင်ရေးလုပ်ငန်းစီမံချက် (မြို့နယ်အထွေထွေ အုပ်ချုပ်ရေးဦးစီး၏ဌာန၊ ကျိုင်းတုံမြို့၊ ကျိုင်းတုံခရိုင်၊ ရှမ်းပြည်နယ် (အရှေ့ပိုင်း))(၂၀၁၆ ခုနှစ် ၊ ဖေဖော်ဝါရီလ ၂၈ ရက်)
27. မြို့နယ်စည်ပင် သာယာရေးကော်မတီ ၏ တိုးချဲ့ရေပေးရေးဆောင်ရွက်မည့် စီမံချက် (ကျိုင်းတုံမြို့)

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Appendix

Water Quality report for Kengtung Township (Eastern Shan State)

Survey Item

Parameters for water quality survey are determined so as to cover the parameters of existing environmental standards. The following parameters are measured and analyzed insitu as well as laboratory.

(1) Temperature

(2) Hydrogen Ion Concentration (pH)

(3) Oxidation / Reduction Potential (ORP)

(4) Dissolved Oxygen (DO)

(5) Electrical Conductivity (EC)

(6) Todal Dissolved Solid (TDS)

(7) Salinity

(8) Turbudity

Sampling Method

The parameters of pH, temperature, dissolved oxygen (DO), Oxidation / Reduction Potential (ORP), Todal Dissolved Solid (TDS), Salinity and electrical conductivity (EC) were measured at each site concurrently with sample collection by the field equipment shown in following table.

Field Equipment for Water Quality Survey

No	Equipment	Manufacturer	Model
1	smarTROLLMultiparameter Handheld	America	**Conductivity:** ±0.5% + 1 µS/cm typical; ±1% max. range
2	**Chemical parameters:** Dissolved oxygen, conductivity (actual and specific), pH, ORP		**Dissolved Oxygen:** ±0.1 mg/L from 0 to 8 mg/L; ±0.2 mg/L from 8 to 20 mg/L; ±10% of reading from 20 to 50 mg/L

			**Level/Depth/Pressure:** Typical ±0.1% full scale (FS) @ 15° C; ±0.3% FS max. from 0 to 50° C
3			**ORP:** ±5.0 mV
3			**pH:** ±0.1 pH unit from 0 to 12 pH units **Temperature (probe):** ±0.1° C **Temperature (battery pack):** ±2° C

Summary of sampling points (surface Water)

Detailed Sampling Point

Category	Sampling Point	Coordinates	Description of Sampling Point
Surface Water	KT-1	21°17′24.4"N 99° 30′ 9.6"E	the creek originated at 11 mile waterfall
Surface Water	KT-2	21° 16′ 59.1" N 99° 33′ 51.3"E	Kenttung Creek
Surface Water	KT-3	21° 17′ 29.1" N 99° 35′ 51.7" E	Nong Tong Lake
Surface Water	KT-1NAC	21°17′24.4"N 99° 30′ 9.6"E	NantAww Creek

Summary of sampling points (Groundwater Water)

The locations of sampling points are shown in table 2. The detail of each sampling points are described as below.

Sampling points of surface water quality survey

Category	Sampling Point	Coordinates	Description of Sampling Point
Groundwater Water	KT-4	21° 15′ 53.9" N 99° 37′ 01.3" E	Hand-dug well near the golf club

Groundwater Water	KT-5	21° 17´ 33.3" N 99° 36´ 51"E	Tube well in Ward 3

Water Quality Result for Kengtung Township

Location	KT1	KT2	KT3	KT4	KT5	KT1NAC
Temp (C)	28.32	28.26	28.26	27.89	28.03	27.82
RDO (mg/L)	7.42	7.57	6.81	5.01	5.2	7.64
RDO Sat (%)	96.2	98.3	88.4	64.5	67.1	98.3
pH (pH)	7.27	7.32	7.36	6.53	6.13	6.87
ORP (mV)	228.1	150.4	114.3	177.4	129.9	104.8
EC	120.8	70.8	291.9	196.8	262.6	75.5
Salinity (psu)	0.1	0	0.1	0.1	0.1	0
TDS (ppm)	73.83	43.26	178.57	121.19	161.37	46.59
Turbidity (FNU)	4.7	395	125	2.7	1	21.2

Water Quality of Naung Tone Lake (March,2016)

Location	Naung Tong Lake
Temp (C)	28.26
RDO (mg/L)	6.81
RDO Sat (%)	88.4
pH (pH)	7.36
ORP (mV)	114.3
Act Cond (ÂµS/cm)	291.9
Salinity (psu)	0.1
TDS (ppm)	178.57
Turbidity (FNU)	125

Source: Photo taken by researcher (MEI) and Test by Smart Toll Instrument (2016)