Report on Environmental and Social Impact Assessment (ESIA)

for New Kunlong Bridge Project

Prepared for:

Department of Bridge, Ministry of Construction

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LIST OF ABBREVIATIONS

%	Percentage
ºC	Degrees Celsius
ºF	Degrees Fahrenheit
cm	Centimeter
dB(A)	Decibel unit
ft	Feet
hPa	Hectopascal
in	Inches
in Hg	Inch of Mercury
Kg	Kilogram
km	Kilometer
km/hr	Kilometer per hour
Kt:	Kilo Ton
kV	Kilovolts
KVA	Kilo Volt Ampere
mg/m^3	Milligram per cubic meter
m^3	Cubic Meter
m^3/day	Meter cubic per day
mg/l	Milligram per Liter
ml	Milliliter
mmHg	Millimeter of mercury
mph	Miles per hour
mV	Millivolts
MW/h	Mega Watt per Hour
µg/m3	Micro Gram per Cubic meter µS/cmMicro Siemens per Centimeter
AOI	Area of influence
BOD	Biochemical Oxygen Demand
CFU	Colony Forming Units
CIA	Cumulative Impact Assessment
CID	Card Identification Number
CO	Carbon Monoxide
CO2	Carbon Dioxide
COC	Chain of custody
COD	Chemical Oxygen Demand
CSR	Corporate Social Responsibilities
DBS	Dry Season Biodiversity Survey
DDGS	Dried Distillers Grain with Soluble
DOB	Department of Bridge
ECD	Environmental Conservation Department
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment

ESMP	Environmental and Social Management Plan
GAD	General Administrative Departments
GDP	Gross Domestic Product
GPS	Global Positioning System
HIV	Human Immunodeficiency Virus
HSE	Health, Safety and Environment
IEE	Initial Environmental Examination
ILO	International Labour Organization
IMR	Infant Mortality Rate
IT	Information Technology
IUCN	International Union for Conservation of Nature
LAeq(dBA)	Equivalent Continuous Level Maximum
LDL	Lower Detection Limit
Max	Maximum
MIC	Myanmar Investment Commission
Min	Minimum
MMR	Maternal Mortality Rate
MOECAF	Ministry of Environmental Conservation and Forestry
MONREC	Ministry of Natural Resources and Environmental Conservation
MSDS	Material Safety Data Sheets
MT	Metric Ton
NEQEG	National Environmental Quality (Emission) Guidelines
NGOs	Non-Government Organization
NO2	Nitrogen Dioxide
NOx	Nitrogen Oxides
NTU	Nephelometric Turbidity Units
O3	Ozone
ORP	Oxidation-Reduction Potential
OSHA	Occupational Safety and Health Administration
pH	Potential of Hydrogen
PM10	Particulate Matter less than 10 micron
PM2.5	Particulate Matter less than 2.5 micron
PPE	Personal Protective Equipment
ppm	Part Per Million
ppt	Parts per thousand
PTN	Palatin Technologies Inc
SO2	Sulfur Dioxide
SOx	Sulfur Oxides
TB	Tuberculosis
TCU	True Color Unit
temp	Temperature
TSS	Total Suspended Solid
UNFCCC	United Nations Framework Convention on Climate Change

US	United States
USD	United States Dollar
VEC	Valued Ecosystem Components
WBS	Wet Season Biodiversity Survey
WHO	World Health Organization

1. EXECUTIVE SUMMARY

A. Executive Summary English Version

1.1 Introduction

Kunglon bridge has been in service since 1965 connecting northern Shan State of Myanmar to China's Yunnam Province. Due to the old age, Kunlong suspension bridge has been encountering issues related to structural wears, durability, and stability in addition to not being able to match with the demand in the era of growing trade and transportation to and from China. All these conditions govern relevant authorities to explore other means to address these concerns.

1.2 Presentation of the Project Proponent

Myanmar and Chinese governments have signed economic and technical cooperation agreement and Memorandum of Understanding (MOU) for building a new Kunlong Bridge in northern Shan state of Myanmar with Chinese Government's grant in 2018. The project would specially facilitate the transportation of Myanmar's agricultural and livestock products to China, thus boosting the rapid development of border trade between the two countries. Under the direct supervision by Director General of the Department of Bridge, a chief engineer will be assigned to administer and supervise the implementation of the bridge project management unit (PMU).

1.3 Presentation of the Environmental and Social Experts

Social and Environmental Associate- Myanmar (SEAM), a registered environmental and social consulting firm is working with clients to identify and address the environmental and social impacts in compliance with Myanmar. Its roles are to develop ESIA, RAP, and EMMP to provide technical advice for developing ESMP, and to assist the project's implementation of the environmental and social management program in every possible way in alignment with the requirements adopted by Environmental Conservation Department (ECD) and the implementing agency, DOB.

1.4 Policy, Legal & Institutional Framework

National Environment Policy of Myanmar's objective is to establish sound environment policies in the utilization of water, land, forests, mineral, marine resources and other natural resources in order to conserve the environment and prevent its degradation. Environmental Impact Assessment Procedure (December 2015) stipulate the detail procedures to be followed by any organization or person relating to EIA in conducting the EIA process. Environmental Impact Assessment (EIA) is to be conducted strictly in line with the existing ESIA rules, regulations, and procedure of Myanmar.

A brief description of relevant environmental legislations and institutional framework such as Land Acquisition(2019), Environmental Impact Assessment Procedures (2015), Race and Religious Protection Laws (2015), Environmental Conservation Rules(2014), Law on Health and Safety in the Workplace (2014), Environmental Conservation Law (2012), Vacant, Fallow and Virgin Lands Management Law 2012, Conservation of Water Resources and Rivers

Law (2006), National Environmental Policy(1994), The forest law (1992), Protection of wildlife, wild plant and Conservation of Natural Area Law (1994), Minimum Wage Law, 2015, Labor Dispute Settlement Law (2012), and National Environmental Quality (Emission) Guidelines (NEQEG) have been examined.

1.5 DOB's Environmental & Social Polices and its Standard

DOB makes commitments not only to avoid adverse environmental impacts and negative social effects from its operations but also to scale up efforts to promote environmental conservation and social developments of the communities**.** Most importantly, DOB plans to set training and promotion programs for its core environmental values and good practices to its workforce and communities. As a government entity, DOB strictly adheres to Myanmar's Minimum wage law and prohibition of child labor in any of its operations. Overtime fees as defined by the government of Myanmar will be provided for any overtime work. Standard Personal Protective Equipment (PPE) will be provided adequately. DOB is also committed to provide safe and sound working environment for all employees and all work-related health and safety regulations will be strictly enforced. Moreover, the department has put in place all fire safety procedures, measures, and equipment. Local fire department will make regular inspection and certify the department's fire safety plan.

1.6 Project description & alternative selection

To boost the trade and transportation between northern Shan State, China's Yunnam Province, and the central areas of Myanmar, China has pledged to support a new Kunlong bridge since early 2018, that is about 323 meters in length with 3.9 Km linking road. With the demand more lanes for higher number of traffic in the improving trade and more stable load bearing, the new bridge becomes necessity for the DOB. DOB will administer the new Kunlong Bridge Project. With the Chinese grant, it will be built linking Chin Shwe Haw – Kunlong – Theinni road which is ultimately an important feature to reach to Lashio.

The new Kunlong Bridge will be situated on the Salween River (Thanlwin River) at 49/1 Mile, 3 KM upstream of the existing bridge in Kunlong involving building of 323-meter-long with 12 m span bridge and nearly 4Km long with 8.5 m span approach road occupying 260 meters in length of main bridge. It will support 2 lanes on each direction. The proposed project will consist of a river crossing bridge, approach road, drainage and retaining wall structures for soil stabilization applications, traffic control systems, and safety features. Balanced Cantilever type box girder bridge will be installed. DOB plans to start the construction of the new bridge in early 2019-2020 fiscal year and will be completed in 2021-2022 fiscal year with the duration of 24 months. Projected budget for the bridge is estimated nearly US$ 13 million.

Manpower requirements During Construction

During construction phase, the project will employ especially from local people at peak workforce for two years to complete the Bridge Project. Local workers shall be used to the extent possible, though outside skilled workers will also be required. The contractor shall provide workers with protective gears (PPE), e.g. masks, helmets, gloves, and safety shoes at no cost to workers by sharing the adequate information about importance of PPE and training of proper use.

Construction machineries

The required construction equipment such as batching plant, excavator, roller, loader, water bowser, crane, grader and tipper or truck will be employed approximately in the construction of the bridge. Raw materials such as cement and reinforced bars will be imported from China and other construction composite materials such as sand and gravel will be obtained locally.

1.7 Description of Surrounding Environment

The whole project area in Kunlong lies on the narrow stretch of Thanlwin River valley between two mountain ranges in the North and the South. Hilly terrain dominates the whole area. Thanlwin River flows from west to east in this particular area. Remnant of natural forest with difficult access could be observed on hill tips overwhelming the secondary forests and ever-expanding rubber plantations. The whole project area is surrounded by rubber plantations. While the environmental related impacts are limited to an area of 500 meters wide, the direct and indirect anticipated social, cultural and visual impacts will be set within 1.5 Km due to land acquisition, and access road construction.

Topography

Kunlong township area exists in a mountainous region with a few terrains leading to noticeable gradient toward the west. Elevation of the terrain on the mountain so called "Main Ma Hla" rises from east to west. Kunlong is above sea level of 1413 feet and the highest mountain, "Tar Shwe Htan" mountain is situated above 7171 feet. River and creeks are relatively low within the area. The project site is surrounding by the mountainous areas and it covers mostly forest areas, agricultural surroundings, public and private plantations especially rubber and corn.

Climate

Tropical wet and dry climate is the classic climate of Kunlong township. The climate is generally wet year-round with slight minor variations. The highest amount of precipitation occurs in August, with an average of 22.24 mm. The driest month, March receives 0.01 mm of rainfall. The warmest month of the year is April with an average temperature of 31 °C. The temperature here averages 28.25 °C and the average rainfall is 6.03 mm. The lowest average temperatures in the year occur in February with around 5°C. The difference in precipitation between the driest month and the wettest month is 22.24 mm.

Environmental Conservation area

There is no protected area in the surrounding areas of the project area. In terms of environmental conservation, total forest areas (8026 acres) are conserved including reserved forest area and non-reserved forest area. Moreover, public owned forest area (42 acres) and mixed crops cultivation with forest area (30 acres) are done by the government together with the private sector in the fiscal year of 2017-2018 including the plantation of Teak, Pyin Ka Toe, Yae Tin Win, and Maezalae.

Air Quality Monitoring

The ambient air quality assessments were conducted in four locations for two times: once in September 2019 and another in December 2019. Air monitoring measured national air quality standards and TVOC by monitoring on 24 hours for SO2, CO, PM2.5, PM10, 1 hour in NO2, and 8 hours in Ozone with air quality monitoring instruments. The observed data was processed with the respective NEQEG standards and WHO guidelines. The concentrations for PM_{10} and $PM_{2.5}$ for both seasons were lower than national standards and WHO for all stations except KLA 3. Also 24 hours concentrations for SO_2 and the hourly maximum concentration for NO_2 were low too in both seasons. At all stations, the concentrations for CO in two seasons are low in comparison with the WHO 24-hour mean target levels.

Noise monitoring

To obtain representative noise monitoring and vibration levels, the monitoring campaign was conducted in four places around the project area. A CEM (DT-8852) sound level meter for 24 consecutive hours and Vibration Meter (SDL 800) for 15 minutes were employed each at four locations. 24 hours continuous monitoring of noise levels were investigated in comparison with the NEQEG Standard and WHO guidelines. The results of noise level in two seasons for all monitoring points except in the south part of project site (KLA 1) were under the limited standard. As thinly populated residential areas have been observed, the contribution of noise level from the populace at KLA 1 is negligible.

Water Quality

Water sources were geo-referenced and onsite water quality tests were performed for upstream point, downstream and the new bridge locations of the river. Portable and reliable equipment including YSI multiple parameters were carried out. For field water quality analysis, parameters specifically PH, EC, Salinity, Turbidity, water temperature, ORP, DO, and TDS together with the information for ambient air temperature and weather conditions will be measured. Array of parameters specified in NEQEG Guidelines were analyzed in a laboratory. The result of pH level is within the limited standard by NEQEG. But the result of total suspended solid in all points is over the limited standard by NEQEG for the first season while the high level of Phosphorus could be noted in both upper section and lower section of the river for the second season.

The depth at the north, the middle, and the south part of the river during the dry season was observed at 1.5 m, 12 m, and 9.9 m in KLB-1, 3.81 m, 12.89 m, and 2.62 m depth at KLB-2 and 5.6 m, 6.58 m, and 1.35 m for KLB-3. The flow velocity varied from 0.19 m/s, 0.86 m/s, and 0.09 m/s at KLB-1, no measurable flow, 1.22 m/s, and 0.72 m/s for KLB-2 and no measurable flow, 0.3 m/s, and no measurable flow for KLB-3.

Geology and Soil

Generally, Kunlong and the project area are covered by Plateau Lime Stone Unit. The top soil layer is clayey soil layer in reddish color with low to medium plasticity in moist condition, widely mixing the lime stone fragment. Based on the local distribution of vegetation, agricultural practices, and the sighting of change in soil patterns, four locations around the

bridge construction site were identified primarily for soil samplings and monitored its samples with Geophysical random sampling method. Soil is generally separated into two horizons of minerals and organic constituents of variable depth. The physio- chemical characteristics of soil such as Cadmium, Copper, Lead, Nitrogen, Phosphorous, Potassium, pH etc., have been determined. Based on the laboratory analysis, no sample displayed above the alarming serious trace of heavy metal concentration with regards to the USEPA Standards.

Natural Hazards

Over the last 10 years, Myanmar has been impacted by two major earthquakes, three severe cyclones, floods and other smaller-scale hazards. According to the Government's Department of Disaster Management (DDM), the project site hasn't been experiencing flesh floods in the recent years. The project area falls in the severe zone for earthquake based on Myanmar Seismic Zone.

Biological Components

Field investigation for biological components has been done during September, 2019 and December 2019 altogether oral recollection from the long-term residences and collection from the hunters and fishermen along the project areas. The proposed project area is generally surrounded by rubber plantation, corn plantation. bamboo, Maezali, Thitale, and Loukya. During the wet season, the observed plants were found from 12 to 24 species for each monitoring points and 24 species were found in dry season. The observed plants were classified into groups: tree, small tree, shrub, herb, climber, bamboo and grass in accordance with the International Union for Conservation of Nature (IUCN) Red list Category. During the wet season, two different types of birds, 32 species of moth butterfly and caterpillar, and also 6 other insects were sighted and during the dry season, 6 species of moth butterfly and caterpillar, and 14 kinds of fish along the Thanlwin river were observed. According to the local hunter around the project area, (22) number of total animals were often found in the natural habitat area around the project site including mammal, some Centipede and Millipede species.

Social Economic Components

Primary emphasis of the investigation for socio-economic situation of the area was conducted in October 2019 and will capture socio-economic status, protected items, and potential advantages and disadvantages of the project on the local populace. The current population of Kunlong Township is 57,501 with 5,837 people in township area, and 51,664 people in the rural areas. Overwhelming majority of KunLong residents are Koe Kant (67.66%) while the rest constitutes Kachin, Wa (Lwae La), Myaung Zee, Shan, Burmese, and the others. Among them, Buddhists are in huge quantity followed by Christian, Hindu, Islam and others. Total reserved forest areas cover (8,028) acres**.** Commercial forest area covers 915 acres, which include teak. Monsoon rice stands the highest rate of cultivation followed by sugarcane, maize(rainy) and the other crops. The employment rate of Kunlong Township is 98%.

Holi Village tract with 320 households hosts the population of 2,000, whereas Kaik Pan Village of Holi village tract with 18 households has the population of 80. Tadar Oo village has reportedly 120 households while Ton Kyat village with 270 households has the total population of 1653. Majority of people in Holi and Kaik Pan village is Christian while Buddhist are

majorly distributed in Ton Kyat and Tadar Oo. Generally, a fair percentage of peoples from the area completed high school level education and very few peoples claimed to have no education. Majority of the households in four villages, earn between 100,000 and 400,000 Kyats per month. All households own their houses in four villages. In Holi village, women welfare community, Law Waw Church Association, Kachin Bu Church (KBC), and Social Welfare Association were found while social welfare community was only found in Tadar Oo village. For information and entertainment, majority of total households in Holi village, Tadar Oo village and Ton Kyat village depend on newspaper, TV and social network while the entire village obtains information from social network in Kaik Pan Village. Except Kaik Pan village, electricity is available in Holi village, Tadar Oo village, and Ton Kyat village, however, some are using power from battery and solar energy. Creek serves as major water source in all villages and some use spring water and water from tube wells.

1.8 Environmental and Social Management Plan

To minimize and mitigate the potential impacts, ESMP has employed all the best management practices based on the construction phases: pre-construction, construction, and operation, and also decommissioning, closure and post closure phases of the project, leading to meet the guideline standards of National Environmental Quality (Emission) Guideline (NEQEG).

The degree and significance of potential environmental and social impacts for four project phases are thoroughly identified and illustrated. Significant Potential environmental and social impacts during the project phases are as follows:

Potential Environmental Effects during Pre-construction phase of the new bridge project

- Loss of terrestrial habitats from site clearing and assessment, and survey activities
- Soil erosion by partial land leveling, removing top spoils, removal of trees and plants along the project path
- Dust emission by soil exacerbation
- Disposal of earthen materials and plant debris by clearing the land and cutting the tree

Potential Environmental Effects during Construction phase

- Potentially temporary alteration in the river's flow regime by laying foundation and diversions
- Loss of terrestrial habitat by land clearing for construction activities
- Air pollution emission from the uses of construction materials and vehicle operations (trucks, cars, crane and motorcycles exhausts),
- Dust emissions by shipping, loading and unloading of construction materials, Stockpiles of construction materials, excavating soils and activities related to earthworks, and leaving exposed earth surface
- Topsoil erosion, soil degradation and contamination by following earthworks, compaction from vehicle activities, excavation of soils, stockpiles of construction

materials, construction activities and crew's movement, and disposal of construction spoils

- Noise and vibration risk from unloading construction materials, movements of heavy vehicles and related activities, construction crews
- Solid wastes and construction spoils from construction activities and shipping materials
- Domestic waste generation from construction workers and management crews

Potential Social Effects during Construction phase

- Tension and conflicts, and job competition between local and migrant workers
- Discrimination, gender inequality, refusal for workers with disabilities, disregards to overtime compensation to overtime compensation
- Land dispute, involuntary resettlement, and disadvantageous to minority ethnic communities
- Safe working environment, accidents, and health provision

Potential Environmental Effects during Operation phase

- Pollution from the use of equipment and crew, maintenance activities
- Waste generation from maintenance activities and spoils
- Traffic blockage and delay leading to traffic congestion locally

Potential Social Effects during Operation phase

- Work related injury and accidents, dangerous working environment
- Incidents and emergency cases from operation and maintenance
- Potential Hazards during the time of natural and man-made hazards

Potential Environmental Effects for Decommissioning, closure and post closure phases

- Solid wastes disposal from demolition debris and ruins, Scrap metals
- Demolishing of buildings and infrastructures and transportation of demolished wastes and debris
- Noise and Vibration due to the operation of demolishing activities working with heavy machinery and equipment

Potential Social Effects for Decommissioning, closure and post closure phases

- Health and safety issues caused by demolition of the infrastructures
- Loss of jobs and unemployment

1.9 Resettlement Action Plan (RAP)

While legal requirements in Myanmar do not require to the level of resettlement action plan (RAP) and ethnic minority management plan (EMMP), the proposed new bridge project will adopt RAP and EMMP to ensure fair treatments and to protect the ethnic minorities, and

Department of Bridge (DOB) will ensure adherence to the commitments in RAP and EMPP according to DOB policies and procedures.

In order to negate the adverse impacts, RAP deals with potential impacts and mechanisms: valuation and compensation for losses at replacement cost, programs for restoration of livelihoods and standards of living, consultation and participation arrangements in the compensation processes, and implementation schedule in combination with grievance procedures, monitoring, and evaluation of the process. Full-fledged RAP will require the resettlement of over 200 peoples. DOB ensures public disclosure of the RAP to the general public in the project area, by ensuring the compensation for land, standing crops, and lost assets to be paid prior to the time of impact according to the new land acquisition law in August 2019. DOB's RAP will provide measures to help affected people at least restore the pre-project level of livelihood with the proper voluntary land donations process.

To avoid adverse social impacts and provide equitable and culturally appropriate project benefits to local ethnic minority communities and other vulnerable population group, Ethnic Minority Management Plan (EMMP) will be developed leading to provide DOB with the operational planning framework. In addition, DOB will conduct social screening and impact assessments to identify the presence of ethnic minorities, leading to minimize and mitigate negative impacts.

10. Public Consultation and Disclosure

Four villages all in all namely Holi village, Kaik Pan village, Tadar Oo village and Ton Kyat village in Kunlong Township fall into the project affected area. 1st Public consultation sessions were planned in Holi village and Ton Kyat village near Kunlong on 2nd October, 2019 and 62 participants from Holi and 72 attendees from Ton Kyat village took part. Meanwhile 2nd consultation meeting was held in the same places on 14th December 2019 with (62) participants from Holi and (31) attendees from Ton Kyat village. Facilitation and documentation were performed by the consultant team while despite the absence of the representative from DOB, officers from Department of Road administered the event

The participants at the public consultation raised their concerns such as the methods and valuation that the project will apply in the land acquisition process and the rate determination for the rubber plants, and fair, equal, and transparent compensations right to the property owners directly. The peoples in Holi Village expressed their worries over traffic congestion, blockade, traffic related safety issues, and the future road widening that could see the removal of many homes in their Village. The peoples from Ta-Dar-Oo Village urged necessary rehabilitation to the existing bridge and continuous use of the bridge for the local communities, and also reminded that the existing bridge is historically important and therefore, it should be kept and maintained to be in a good condition. The communities from Kaik Pan Village were worried for some of their community forests, and requested to seek prior agreements if the project has to use those community forests. Also, the improvement of road access and electrical power supply to their village, was their hopes concerned with the development project.

At public consultation in the afternoon at Tone Kyat, the villagers raised the compensation method, rate, and payment method, about the right to use the remaining land

along the project area, issues related to burial places and places with religious importance, early negotiation for land acquisition, transparent transition of fund in the compensation process, proper relocation with their prior approval if it falls in the construction zone. Participants from all villages showed excitement with possible job opportunities for their villagers in the project implementation. Further discussions with DOB are needed to address their concerns and these matters will be discussed in the next public consultations.

Majority of discussions in 2nd consultation meeting centered on the land acquisition questions. Some members of the communities raised the concern over the timeline of the compensation insisting that compensation should be carried out first prior to the construction. The project team responded that the compensation will be the first in the plan and in fact, it would be approximately within a few weeks after the public consultation. A few participants brought up the possibility of providing land substitute in lieu of the land acquired for the project because of the scarcity of vacant land in the area. Many participants brought up the questions related to the rate of compensation in the consultations. Understanding that the rate of compensation is a delicate and sensitive issue to handle, the project team answered that the compensation rates will be determined while the representatives of the communities will be consulted Based on transparency and fairness.

Grievance Redressing Mechanism (GRM)

The project's GRM is intended to receive complaints and issues, and to help communities and workers find solutions for their concerns. 1st tier responsible persons for GRM will be designated staffs from the project's local office and DOB will deploy two designated staffs as 2nd tier responsible persons for GRM. As soon as GRM receives a concern or complaint, it will initiate investigation of the causes and will seek solutions together with the stakeholders within 15 working days. The phone numbers and communication methods will be identified to make it easier for file complaints and report suggestions. The functions and roles of GRM will be explained and the information materials will be made readily available in community centers and in relevant local administrative offices.

B. Executive Summary Myanmar Version (အစီရင်ခံစာ အကျဉ်းမြန်မာပြန်)

စီမံကိန်းအကြောင်းအရာ

ကွမ်လုံတံတားဟောင်းသည် ၁၉၆၅ ခုနှစ်ကတည်းက တည်ဆောက်ထားပြီး ရှမ်းပြည်နယ်မြောက်ပိုင်းမှ တရုတ်ပြည်သူ့သမ္မတနိုင်ငံ၊ ယူနန်မြို့သို့ ကူးသန်းသွားလာရာတွင် အရေးပါသောတံတားတစ်စင်းဖြစ်သည်။ နှစ်ကာလကြာရှည်စွာ အသုံးပြုခဲ့သည့်အတွက် အဆိုပါတံတားသည် ဖွဲ့စည်းတည်ရှိပုံ၊ ခံနိုင်ရည်ရှိ မှုနှင့်တည်ငြိမ်မှုဆိုင်ရာ ချို့ယွင်းချက်များဖြစ်ပေါ်နေသည်သာမက ပြည်တွင်းမှ တရုတ်ပြည်သူ့သမ္မတနိုင်ငံသို့ပင်း ပြည်တွင်းသို့ တရုတ်ပြည်သူ့သမ္မတနိုင်ငံမှပင်း ကုန်စည်ကူးသန်းရောင်းဝယ်မှုနှင့် သယ်ယူပို့ ဆောင်ရေးပိုမိုတိုးတက်လာ၍ တံတားအသုံးပြုရာတွင် ဝန်နှင့်ခံနိုင်ရည် မညီမျှလျှက်ရှိသည်။ သို့ပါ၍ သက်ဆိုင်ရာတာဝန်ရှိသူများမှ အဆိုပါအခြေအနေများကို ဖြေရှင်းရန် တံတားအသစ်စီမံကိန်းကို ထည့်သွင်းစဉ်းစားခဲ့ကြသည်။

လူမှုရေးရာနှင့် ပတ်ဝန်းကျင်ဆိုင်ရာဆန်းစစ်မှု ဆောင်ရွက်မည့်အဖွဲ့အစည်း

SEAM-မြန်မာသည် သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားရေးရာသက်ရောက်မှုများကို ဖြေရှင်းဆောင်ရွက်ပေးသည့် အကြံပေးအဖွဲ့အဖြစ် တရားဝင်မှတ်ပုံတင်ထားသည့် အဖွဲ့အစည်းဖြစ်ပြီး စီမံကိန်းအဆိုပြုလုပ်ငန်းရှင်အတွက် လွတ်လပ်သောတတိယအဖွဲ့အစည်းအဖြစ် မြန်မာအစိုးရမှ ချမှတ်ထားသော ပတ်ဝန်းကျင်နှင့်လူမှုဘဝထိန်းသိမ်းမှုဆိုင်ရာ လိုအပ်ချက်များနှင့် စံချိန်စံညွှန်းများနှင့်လိုက်လျောညီထွေစွာ သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုဆန်းစစ်ရေးလုပ်ငန်းများကို အကောင်အထည်ဖော်ဆောင်ရွက်ပေးလျှက်ရှိပါသည်။ SEAM ၏ အဓိကလုပ်ငန်းများမှာ သံယံဇာတ နှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနရှိ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနမှ ချမှတ်ထားသော သတ်မှတ်ချက်များနှင့်အညီ ပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားရေးဆိုင်ရာ စီမံခန့်ခွဲရေးအစီအစဉ်များ ချမှတ်ဆောင်ရွက်ခြင်းဖြင့် စီမံကိန်းအကောင်အထည်ဖော်ဆောင်ရွက်မှုကို ထောက်ပံ့ကူညီရန်၊ ပတ်ဝန်းကျင်နှင့်လူမှုဘဝထိခိုက်မှုများအား ဆန်းစစ်လေ့လာရန်နှင့် ပတ်ဝန်းကျင်နှင့် လူမှုဘဝစီမံခန့်ခွဲမှုဆိုင်ရာစီမံချက်များဖွံ့ဖြိုးတိုးတက်ရေးအတွက် နည်းပညာအကြံဉာဏ်များ ထောက်ပံ့ပေးရန်တို့ဖြစ်သည်။

မူဝါဒ၊ ဥပဒေနှင့် နည်းဥပဒေများ

သဘာဝပတ်ဝန်းကျင်ကို ထိန်းသိမ်းစောင့်ရှောက်ရန်နှင့် ပတ်ဝန်းကျင်ပျက်စီးမှုတို့မှ ကာကွယ်ရန် အလို့ငှာ ရေ၊ မြေ၊ သစ်တော၊ ဓါတ် သတ္တု၊ ရေအရင်းအမြစ်နှင့် အခြားသဘာဝသယံဇာတများအား အသုံးပြုရာတွင် သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ ကောင်းမွန်သောမူဝါဒများ ချမှတ်အကောင်အထည်ဖော်နိုင်ရန်အတွက် မြန်မာနိုင်ငံ၏ အမျိုးသားအဆင့်သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာမူဝါဒများ ထုတ်ပြန်ခဲ့ခြင်းဖြစ်သည်။ ၂၀၁၅ ခုနှစ်တွင် သဘာဝပတ်ဝန်းကျင်ထိခိုက်မှုများ ဆန်းစစ်လေ့လာရေးဆိုင်ရာ လုပ်ထုံးလုပ်နည်းများကို ချမှတ်အကောင်အထည်ဖော်ခဲ့ပြီး စီမံကိန်းလုပ်ငန်းများ ဆောင်ရွက်နေသည့် မည်သည့်အဖွဲ့အစည်းမဆို အဆိုပါ လုပ်ထုံးလုပ်နည်းများနှင့်အညီ လိုက်နာဆောင်ရွက်သွားရမည်ဖြစ်

သည်။ သို့ပါ၍ တံတာဦးစီးဌာန၊ ဆောက်လုပ်ရေးဝန်ကြီးဌာနသည် ၎င်းမူဝါဒများကို လိုက်နာကျင့်သုံးဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

မြန်မာနိုင်ငံ၏ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနမှ ထုတ်ပြန်ပြဋ္ဌာန်းထားသည့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာလုပ်ထုံးလုပ်နည်းများ(၂၀၁၅)၊ သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာ စည်းမျဉ်းစည်းကမ်း(၂၀၁၄)၊ သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာဥပဒေ(၂၀၁၂)၊ ရေအရင်းအမြစ်နှင့်မြစ်ချောင်းများထိန်းသိမ်းရေးဥပဒေ(၂၀၀၆)၊ မြေယာဥပဒေ(၂၀၁၉)၊ မြေလွတ်၊ မြေလပ်နှင့်မြေရိုင်းများ စီမံခန့်ခွဲရေးဥပဒေ(၂၀၁၂)၊ ပြည်ပပို့ကုန်နှင့်သွင်းကုန်ဥပဒေ(၂၀၁၂)နှင့် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာမူဝါဒ(၁၉၉၄)နှင့် အမျိုးသားပတ်ဝန်းကျင်အရည်သွေးဆန်းစစ်မှု(ထုတ်လွှတ်မှု) ညွှန်ကြားချက်တို့ကိုလည်း ဆန်းစစ်လေ့လာခဲ့ပါသည်။ ထို့အပြင် အခြားသက်ဆိုင်ရာနည်းလမ်းဥပဒေများနှင့် စည်းမျဉ်းစည်းကမ်းများကိုလည်း လိုက်နာဆောင်ရွက်နိုင်စေရန် အသေးစိတ်လမ်းညွှန် ဖော်ပြထားပါသည်။ ပတ်ဝန်းကျင်နှင့် လူမှုဘဝထိခိုက်မှု လေ့လာဆန်းစစ်ခြင်း (ESIA) တို့ကို မြန်မာနိုင်ငံ၏ ESIA နည်းဥဒေနှင့် လုပ်ငန်းစဉ်များနှင့်အညီ တိတိကျကျလုပ်ကိုင်ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ အကဲဖြတ်လေ့လာဆန်းစစ်ခြင်းလုပ်ငန်းစဉ် (ဒီဇင်ဘာ၊ ၂၀၁၅ ခုနှစ်) အရ အမျိုးသားပတ်ဝန်းကျင်အရည်အသွေးဆန်းစစ်မှု(ထုတ်လွှတ်မှု) ညွှန်ကြားချက်(NEQEG) ကို ၂၀၁၅ ခုနှစ် နှောင်းပိုင်းတွင် စတင်လိုက်နာဆောင်ရွက်စေခဲ့ပါသည်။ NEQEG ညွှန်ကြားချက်နှင့် အညီ စီမံကိန်း ဆောင်ရွက်ရာတွင် လေအရည်အသွေး သတ်မှတ်ချက်များ၊ ရေဆိုးထုတ်လွှတ်မှု စံသတ်မှတ်ချက်များ၊ လျှပ်စစ်သံလိုက်စက်ကွင်းများ၊ အသံဆူညံမှုနှင့် အနှံ့အရည်အသွေးဆိုင်ရာ စံသတ်မှတ်ချက်များ စသည့် ယေဘုယျလိုအပ်ချက်များအား တိုင်းတာစစ်ဆေးမှုများ ပြုလုပ်ပါသည်။

ပတ်ဝန်းကျင်နှင့် လူမှုရေးရာ ကတိကဝတ်များ

တံတာဦးစီးဌာန(DOB)သည် လေထုတ်လွှတ်မှုများ၊ ဆူညံမှုအဆင့်ထိန်းသိမ်းခြင်း၊ ရေဆိုးစနစ်ဖယ်ရှားရှင်းလင်းခြင်းများဆောင်ရွက်ခြင်းနှင့် မြေဆီလွှာထိန်းသိမ်းခြင်းအား မျှတစွာဆောင်ရွက်ပေးခြင်းတို့ဖြင့် ပတ်ဝန်းကျင်ဆိုင်ရာကိစ္စရပ်များ တိုးတက်ကောင်းမွန်စေရုံသာမက ပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက်နစ်နာမှုများနှင့်လေထုညစ်ညမ်းမှုများကို ထိန်းသိမ်းကာကွယ်ရန်နှင့် ပိုမိုကောင်းမွန်သောပတ်ဝန်းကျင်ကောင်းများ တိုးတက်ဖြစ်ထွန်းလာစေရန်တို့အတွက် ရည်ရွယ်၍ လုပ်ကိုင်ဆောက်ရွက်လျှက်ရှိပါသည်။ ထို့ပြင် DOB သည် စီမံကိန်းဆိုင်ရာ စီမံဆောင်ရွက်သူများနှင့် လုပ်သားများအား သဘာဝပတ်ဝန်းကျင်ကိုတန်ဖိုးထားမှုများနှင့် ပတ်ဝန်းကျင်ထိမ်းသိမ်းရေးနည်းလမ်းကောင်းများဆိုင်ရာသင်တန်းများနှင့်အစီအစဉ်များကို ပို့ချဆောင်ရွက်သွားရန် စီစဉ်ထားပါသည်။ ထပ်မံ၍ DOB သည် မြန်မာနိုင်ငံ၏ အနိမ့်ဆုံးလုပ်ခပေးဆောင်ခြင်းဆိုင်ရာဥပဒေနှင့် မည့်သည့်လုပ်ငန်းတွင်မဆို ကလေးသူငယ်များအလုပ်ခန့်ထားခြင်းဆိုင်ရာ တားဆီးပိတ်ပင်ခြင်းတို့ကို တင်းတင်းကျပ်ကျပ်ကိုင်တွယ်ဆောင်ရွက်ပါသည်။ လုပ်ငန်းခွင်တွင် အချိန်ပိုဆောင်ရွက်သည့်လုပ်အားခများကိုလည်း မြန်မာနိုင်ငံ

အစိုးရမှ သတ်မှတ်ထားရှိသောအချိန်ပိုကြေးများအတိုင်း ပေးဆောင်ရပါမည်။ စံချိန်မှီသည့် မိမိကိုယ်ကို အကာအကွယ်ပေးသည့်ကိရိယာများကိုလည်း လုံလုံလောက်လောက်ထားရှိ ဆောင်ရွက်သွားမည် ဖြစ်သည်။ DOB သည် အလုပ်သမားများအတွက် ဘေးကင်း၍ ကောင်းမွန်သောလုပ်ငန်းခွင်ကို ဖန်တီးပေးသွားမည်ဖြစ်ပြီး ၎င်းတို့၏ကျန်းမာရေးနှင့် လုံခြုံရေးဆိုင်ရာ ကိစ္စများကိုလည်း တင်းကြပ်စွာ ဆောင်ရွက်သွားမည်ဖြစ်သည်။ တံတာဦးစီးဌာနအနေဖြင့် မီးဘေးအန္တရာယ်ကင်းရှင်းဆိုင်ရာ ကိစ္စရပ်များကိုလည်း လိုက်နာဆောင်ရွက်လျက် သက်ဆိုင်ရာဒေသရှိ မီးသတ်ဌာနမှ DOB ၏ မီးဘေး အန္တရာယ်ကင်းရှင်းမှုလုပ်ငန်းစဉ်ကို ပုံမှန်စစ်ဆေးဆောင်ရွက်သွားမည်ဖြစ်သည်။

စီမံကိန်းအကြောင်းအရာ

ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ တရုတ်ပြည်သူ့သမ္မတနိုင်ငံ၊ ယူနန်မြို့နှင့် မြန်မာနိုင်ငံအလယ်ပိုင်းဒေသတို့ အကြား ကုန်စည်ကူးသန်းရောင်းဝယ်မှုနှင့် သယ်ယူပို့ဆောင်ရေး ပိုမိုဖွံ့ဖြိုးတိုးတက်လာစေရေး အတွက် တရုတ်ပြည်သူ့သမ္မနိုင်ငံမှ ၂၀၁၈ ခုနှစ် အစောပိုင်းကာတွင် ကွမ်းလုံတံတားအသစ်ကို တည်ဆောက်ရာတွင် အကူအညီပေးရန် ကတိကဝတ်ပေးခဲ့သည်။ တံတားအရှည်မှာ (၃၂၃) မီတာခန့်ရှိပြီး ချဉ်းကပ်လမ်းမှာ (၃.၉) ကီလိုမီတာ ရှည်လျားပါသည်။ ကူးသန်းရောင်းဝယ်မှုပိုမိုဖွံ့ဖြိုးတိုးတက်လာမှု ကြောင့် တံတား၏ ခံနိုင်ရည်ဝန်အား ပိုမိုခိုင်ခံစေရေးအတွက်ငင်း လမ်းပိတ်ဆို့မှုများ မကြာခဏ ဖြစ်ပေါ်လျက်ရှိသောကြောင့် ၎င်းတံတားအသစ်စီမံကိန်းသည် မရှိမဖြစ် အရေးပါလာသည်။ တံတား ဦးစီးဌာနသည် တရုတ်ပြည်သူ့သမ္မတနိုင်ငံမှ ထောက်ပံ့ငွေဖြင့် တံတားအသစ်စီမံကိန်းကို တာဝန်ယူ ဆောင်ရွက်သွားမည်ဖြစ်သည်။ အဆိုပါတံတားသည် ချင်းရွှေဟော်-ကွမ်းလုံ-သိန္နီကားလမ်းမကြီးနှင့် ချိတ်ဆက်လျက် လာရှိးမြို့သို့ ကူးသန်းသွားလာနိုင်မည့် အရေးပါသောတံတားတစ်စင်းဖြစ်သည်။

ကွမ်လုံတံတားအသစ်သည် ချင်းရွှေဟော်-ကွမ်းလုံ-သိန္နီလမ်း မိုင်တိုင် ၄၉/၁ ရှိ သံလွင်မြစ်ကို ဖြတ်သန်းတည်ဆောက်မည်ဖြစ်ပြီး တံတားအဟောင်း၏ အထက်ဘက် (၃) ကီလိုမီတာအကွာတွင် တည်ရှိပါသည်။ အဆိုပြုတံတားစီမံကိန်းတည်ဆောက်ရာတွင် သံလွင်မြစ်ကို ဖြတ်ကျော်တည်ဆောက်မည်ဖြစ်ပြီး ချဉ်းကပ်လမ်း၊ မြေဆီလွှာခိုင်ခံစေသည့်မြေထိမ်းနံရံနှင့် ရေသွင်းရေထုတ်စနစ်များ၊ ယာဉ်လမ်းကြောပိတ်ဆို့မှု ထိန်းချုပ်သည့်စနစ်များနှင့် ဘေးအန္တရာယ်ကင်းရှင်းမှုစနစ်များ အစရှိသဖြင့် ပါဝင်မည်ဖြစ်သည်။ တံတားပုံသဏ္ဌာန်မှာ Balanced Cantilever type box girder ဒီဇိုင်းဖြစ်ပြီး တံတားဦးစီးဌာနမှ ၂၀၁၉-၂၀၂၀ ခုနှစ်၊ ဘဏ္ဍာရေးနှစ်တွင် စတင်တည်ဆောက်၍ ၂၀၂၁-၂၀၂၂ ခုနှစ်၊ ဘဏ္ဍာရေးနှစ်အထိ (၂) နှစ်ကျော်မျှ တာဝန်ယူတည်ဆောက်သွားမည်ဖြစ်ပြီး စုစုပေါင်းအမေရိကန် ဒေါ်လာ (၁၃) သန်းခန့် ကုန်ကျမည်ဖြစ်သည်။

တည်ဆောက်ရေးကာလ လုပ်သားအင်အား လိုအပ်ချက်

အချိန်ကာလ (၂) နှစ်ကြာမျှ အချိန်ယူတည်ဆောက်မည့် တံတားအသစ်တည်ဆောက်မှုစီမံကိန်း၏ တည်ဆောက်ရေးကာလတွင် လိုအပ်သည့် ပြင်ပမှကျွမ်းကျင်လုပ်သားများ ခေါ်ယူဆောင်ရွက်သွားမည်ဆိုသော်လည်း တံတားတည်ဆောက်မှု ပြီးမြောက်အောင် ဒေသခံများ၏ လုပ်သားအင်အားကို

အများဆုံးခန့်အပ်လျက် အားသွန်ခွန်စိုက် ဆောင်ရွက်သွားမည်ဖြစ်သည်။ ဝန်ထမ်းများနှင့် အလုပ်သမားများကို လုပ်ငန်းခွင်ဆိုင်ရာ ကာကွယ်ရေးပစ္စည်းများ ထောက်ပံ့ပေးလျက် လုပ်ငန်းခွင်ဆိုင်ရာ ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးဆိုင်ရာသင်တန်းများနှင့် ဆောက်လုပ်ရေးလုပ်ငန်းခွင်တွင် ပြင်းထန်သည့် ထိခိုက်ဒဏ်ရာများ ဖြစ်ပေါ်လာနိုင်ချေရှိသည့်အခြေအနေများအား သိရှိနားလည်စေရေးဆိုင်ရာ သင်တန်းများအား တက်ရောက်နိုင်ရန် ဆောင်ရွက်ပေးသွားမည်ဖြစ်သည်။

ဆောက်လုပ်သုံး စက်ယန္တရားများ

တံတားတည်ဆောက်ရာတွင် အသုံးပြုဆောင်ရွက်မည့် စက်ပစ္စည်းများမှာ မြေတူးစက်၊ ဒလိမ့်တုံး၊ ကုန်တင်ကုန်ချစက်၊ ရေကား၊ ဝန်ချီစက်၊ နောက်ဘက်မှ ကုန်ချရန်သတိပေးသည့်ယာဉ်၊ ကုန်တင်ကား စသည်တို့ကိုအသုံးပြုသွားမည်ဖြစ်ပြီး ကုန်ကြမ်းပစ္စည်းများအနေဖြင့် အင်္ကတေနှင့် အထောက်အကူပြုတိုင်များကို တရုတ်နိုင်ငံဘက်မှ တင်သွင်းဆောင်ရွက်သွားမည်ဖြစ်သည်။ ဆောက်လုပ်ရေးလုပ်ငန်းခွင်အတွက် လိုအပ်သည့် သဲနှင့်ကျောက်စရစ်များကို ဒေသတွင်းမှ ရယူအသုံးပြုသွားမည်ဖြစ်သည်။

တံတားအသစ် တည်ဆောက်ရေးနယ်မြေ၏ ပတ်ဝန်းကျင်အခြေအနေ

ကွမ်းလုံမြို့နယ်တွင် တည်ဆောက်မည့်တံတားအသစ်သည် ကျဉ်းမြောင်းစွာစီးဆင်းနေသည့် သံလွင်မြစ်ဝှမ်းကို ဖြတ်သန်းတည်ဆောက်မည်ဖြစ်သည်။ အနောက်မှ အရှေ့သို့ စီးဆင်းနေသော သံလွင်မြစ်၏တောင်ဘက်နှင့်မြောက်ဘက်တို့တွင် တောင်တန်း (၂)ခု ရှိပြီး စီမံကိန်းနယ်မြေပတ်ဝန်းကျင်သည် တောင်ကုန်းတောင်တန်းများဖြင့် ဖုံးလွှမ်းလျက်ရှိသည်။ တောင်ကုန်းများပေါ်တွင် သဘာဝသစ်တောများ ရှားပါးစွာတွေ့ရပြီး အများအားဖြင့် စိုက်ပျိုးထားသော သစ်တောများနှင့် တိုးချဲ့စိုက်ပျိုးထားသော ရာဘာပင်များကို တွေ့ရှိရပါသည်။ တံတားတည်ဆောက်ရေး စီမံကိန်းနယ်မြေပတ်ဝန်းကျင်တွင်လည်း ရာဘာပင်များကိုသာ အများဆုံးတွေ့ရှိရသည်။

သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ ဆန်းစစ်လေ့လာမှုများပြုလုပ်ရန် တံတားတည်ဆောက်ရေးပတ်ဝန်းကျင်တွင် သက်ရောက်မှုဧရိယာ (၅၀၀) မီတာ သတ်မှတ်ဆောင်ရွက်ပြီး လူမှုဘဝ၊ ယဉ်ကျေးမှုနှင့် သိသာထင်ရှားသည့်သက်ရောက်မှုများကိုဆန်းစစ်ရန် မြေယာရယူမှုနှင့် ချဉ်းကပ်လမ်းများတည်ဆောက်မှုအပေါ် အခြေခံလျက် စီမံကိန်းလွှမ်းမိုးမှုဧရိယာအား (၁.၅)ကီလိုမီတာ သတ်မှတ်ဆောင်ရွက်ခဲ့ပါသည်။ စီမံကိန်းပတ်ဝန်းကျင်ရှိ မြေ၊ ရေ၊ လေ၊ ဆူညံမှုတို့၏ အရည်အသွေးနှင့် ဇီဝမျိုးကွဲများနှင့်လူမှုဘဝအခြေအနေများကို မြေပြင်ကွင်းဆင်းဆောင်ရွက်၍လည်းကောင်း ရာသီဥတု၊ ဂေဟဗေဒအရင်းအမြစ်များနှင့် မြေအသုံးချမှုများဆိုင်ရာအချက်အလက်များကို သက်ဆိုင်ရာဌာနများမှလည်းကောင်း ကောက်ယူစုဆောင်းခဲ့ပါသည်။

မြေမျက်နှာပြင်အနေအထား

ကွမ်းလုံမြို့နယ်သည် တောင်ကုန်းများထူထပ်ပြီး မြေပြန့်အလွန်နည်းပါးသော ဒေသဖြစ်ပါသည်။ မိန်းမလှတောင်တန်းမှာ အရှေ့မှအနောက်သို့ သွယ်တန်းလျှက်ရှိပြီး ထင်ရှားသောမြစ်ချောင်းများမှာ သံလွင်မြစ်၊ နမ့်တိန်ချောင်းနှင့် နမ့်လင်းချောင်းတို့ဖြစ်ပါသည်။ ပင်လယ်ရေမျက်နှာပြင်အထက် (၁၄၁၃)ပေတွင် တည်ရှိသည့် ကွမ်းလုံမြို့နယ်သည် မြစ်ချောင်းများနည်းပါးသည့်ဒေသဖြစ်ပြီး အမြင့်ဆုံးတောင်မှာ အမြင့်ပေ (၇၁၇၁)ပေရှိသည့် တာရွေထန်တောင် ဖြစ်သည်။ တံတားစီမံကိန်းနေရာသည် တောင်ကုန်းတောင်တန်းများ ဝန်းရံထားပြီး သစ်တောများ၊ စိုက်ပျိုးရေးဧရိယာများ၊ ရာဘာနှင့် ပြောင်းဖူးပင်များဖြင့် ဖုံးလွှမ်းလျက်ရှိပါသည်။

ရာသီဥတု

အပူပိုင်းစိုစွတ်ခြောက်သွေ့သောရာသီဥတုမှာ ကွမ်းလုံမြို့နယ်၏ ထူးခြားကောင်းမွန်သော ရာသီဥတုဖြစ်သည်။ ယေဘူယျအားဖြင့် ရာသီဥတုသည် တစ်နှစ်ပတ်လုံးစိုစွတ်ပြီး အနည်းငယ်သာအပြောင်းအလဲရှိသည်။ ဩဂုတ်လတွင် မိုးရေချိန်အများဆုံးရရှိလေ့ရှိပြီး ပျှမ်းမျှအားဖြင့် (၂၂.၂၄) မီလီမီတာဖြစ်ပါသည်။ အခြောက်သွေ့ဆုံးလမှာ မတ်လဖြစ်ပြီး မိုးရေချိန် (၀.၀၁) မီလီမီတာသာရရှိပါသည်။ တစ်နှစ်ပတ်လုံးတွင် ဧပြီလသည် အပူနွေးဆုံးလဖြစ်ပြီး ပျှမ်းမျှအပူချိန် (၃၁)ဒီဂရီစင်တီဂရိတ်ရှိပါသည်။ တနှစ်ပတ်လုံး၏ ပျှမ်းမျှအပူချိန်မှာ (၂၈.၂၅)ဒီဂရီစင်တီဂရိတ်ရှိနှင့် ပျှမ်းမျှမိုးရေချိန်မှာ (၆.၀၃) မီလီမီတာရှိပါသည်။ ဖေဖော်ဝါရီလသည် တနှစ်ပတ်လုံးတွင် အပူချိန်အနိမ့်ဆုံးဖြစ်ပြီး အပူချိန်မှာ (၅) ဒီဂရီစင်တီဂရိတ်သာရှိသည်။ အခြောက်သွေ့ဆုံးကာလနှင့် စိုစွတ်မှုရှိဆုံးကာလတို့အကြားတွင် မိုးရေချိန် (၂၂.၂၄) မီလီမီတာ ကွာခြားပါသည်။

ပတ်ဝန်းကျင်ထိန်းသိမ်းစောင့်ရှောက်ရေးနယ်မြေဧရိယာ

တံတားတည်ဆောက်မည့် စီမံကိန်းပတ်ဝန်းကျင်တွင် ထိန်းသိမ်းကာကွယ်စောင့်ရှောက်ထားသော ဧရိယာမရှိပါ။ သို့သော် ပတ်ဝန်းကျင်ထိန်းသိမ်းစောင့်ရှောက်ရေးအနေဖြင့် ထိန်းသိမ်းထားသောသစ်တောဧရိယာနှင့် သဘာဝသစ်တောဧရိယာများအပါအဝင် စုစုပေါင်းသစ်တောဧရိယာ (၈,၀၂၆) ဧကရှိပါသည်။ ပုဂ္ဂလိကသစ်တောစိုက်ခင်း(၄၂-ဧက)နှင့် သစ်တောနှင့်သီးနှံရောနှောစိုက်ပျိုးထားသည့် စိုက်ခင်း(၃၀-ဧက) တို့ကို အစိုးရမှ (၂၀၁၇-၂၀၁၈)ခုနှစ် ဘဏ္ဍာရေးနှစ်တွင် ပုဂ္ဂလိကကဏ္ဍနှင့်အတူ စိုက်ပျိုးဆောင်ရွက်ပြီးစီးခဲ့ပါသည်။ အဆိုပါ စိုက်ခင်းတွင် ကျွန်းသစ်၊ ပျဉ်းကတိုး၊ ရဲတင်းဝင်းနှင့် မဲဧလီစသည့်အပင်များလည်း ပါဝင်ပါသည်။

လေအရည်အသွေး

လေထုအရည်အသွေးအကဲဖြတ်လေ့လာမှုကို နေရာ(၄)နေရာခွဲ၍ စောင့်ကြပ်ကြည့်ရှုရာတွင် ၂၀၁၉ ခုနှစ်၊ စက်တင်ဘာလတွင် (၁)ကြိမ်နှင့် ၂၀၁၉ ခုနှစ်၊ ဒီဇင်ဘာလတွင် (၁)ကြိမ် စုစုပေါင်း (၂)ကြိမ် တိုင်းတာလေ့လာခဲ့ပါသည်။ ပကတိလေထုအရည်အသွေးအားစောင့်ကြည့်ရှုရာတွင် ကမ္ဘာ့ ကျန်းမာ

ရေးအဖွဲ့နှင့် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး(ထုတ်လွှတ်မှု)လမ်းညွှန်ချက်များ၏ စံချိန်စံနှုန်းသတ်မှတ်ချက်များနှင့်အညီ PM10, PM2.5, CO နှင့် SO2 တို့ကို (၂၄)နာရီပတ်လုံး စောင့်ကြည့်တိုင်းတာ၍ NO2 ကို (၁)နာရီနှင့် Ozone ကို (၈)နာရီကြာမျှ စောင့်ကြည့်တိုင်းတာစစ်ဆေးပါသည်။ စိုစွတ်ကာလနှင့် ခြောက်သွေ့ကာလဟူ၍ (၂)ရာသီ၌ တိုင်းတာစစ်ဆေးမှုများအရ (၂)ရာသီလုံးတွင် လေထုအရည် အသွေးစောင့်ကြပ်ကြည့်ရှုသည့်နေရာ နံပါတ်(၃)မှလွဲ၍ ကျန်သည့်နေရာ (၃)နေရာတွင် PM10နှင့် PM2.5 တို့၏ ရလဒ်များမှာ သတ်မှတ်စံနှုန်းထက်နည်းပါးပြီး NO2၊ SO2 နှင့် CO တို့၏ ရလဒ်များမှာ နေရာ (၄) နေရာလုံးတွင် သတ်မှတ်စံနှုန်းထက် နည်းပါးနေသည်ကို တွေ့ရှိရပါသည်။

ဆူညံမှု

အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး(ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များနှင့်အညီ (၂၄)နာရီပတ်လုံးအတွက် အသံဆူညံမှုအဆင့်နှင့် (၁၅)မိနစ်ကြာမျှ တုန်ခါမှုအဆင့်တို့ကို စီမံကိန်းပတ်ဝန်းကျင်ရှိနေရာ (၄) နေရာသတ်မှတ်၍ စောင့်ကြပ်ကြည့်ရှု တိုင်းတာစစ်ဆေးခြင်းကို စိုစွတ်ရာသီနှင့် ခြောက်သွေ့ရာသီဟူ၍ (၂)ရာသီခွဲ၍ ပြုလုပ်ခဲ့ပါသည်။ ဆူညံမှုကိုတိုင်းတာရာတွင် CEM (DT-8852) ဖြင့် တိုင်းတာ၍ တုန်ခါမှုကို (SDL 800) တုန်ခါမှုတိုင်းကိရိယာဖြင့် တိုင်းတာရယူခဲ့ပါသည်။ ဤစီမံကိန်းအတွက် အသံဆူညံမှုအဆင့်တိုင်းတာရရှိမှုသည် (၂)ရာသီလုံးတွင် နေရာ(၃)နေရာ၌ လမ်းညွှန်ချက်ပါ ဆူညံမှုအဆင့် ထက်ကျော်လွန်ခြင်းမရှိသော်လည်း တိုင်းတာမှုပြုသည့်နံပါတ်(၁)နေရာ (တံတားအသစ်ဆောက်လုပ်မည့်နေရာ၏တောင်ဘက်)တွင် လမ်းညွှန်းချက်ပါ ဆူညံမှုအဆင့်ထက် အနည်းငယ်ကျော်လွန်နေပါသည်။ သို့သော်လည်း တံတားတည်ဆောက်မည့်ပတ်ဝန်းကျင်တွင် လူနေအိမ်ခြေနည်းပါးသည့်အတွက် အဆိုပါအသံဆူညံမှုမှာ မပြောပလောက်ပါ။

ရေအရည်အသွေး

ရေအရင်းအမြစ်များသည် ပထဝီဒေသကို အခြေခံ၍ ဖြစ်ပေါ်လာခြင်းကြောင့် ရေအရည်အသွေးတိုင်းတာစစ်ဆေးခြင်းကို ဖြတ်သန်းတည်ဆောက်မည့် သံလွင်မြစ်ပတ်ဝန်းကျင်၊ သံလွင်မြစ်အထက်ပိုင်းနှင့်အောက်ပိုင်းဟူ၍ အပိုင်း (၃) ပိုင်းခွဲခြား၍ ပကတိရေအရည်အသွေးကို စောင့်ကြည့်စစ်ဆေးလျှက် YSI multiple parameters ဖြင့် တိုင်းတာရယူခဲ့သည်။ ထိုပြင် စီမံကိန်းအနီး ရွာ(၁)ရွာမှလည်း ရေအရည်အသွေးကို တိုင်းတာရယူခဲ့ပါသည်။ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး(ထုတ်လွှတ်မှု)လမ်းညွှန်ချက်တွင် သတ်မှတ်ပြဋ္ဌန်းထားသော ရေအရည်အသွေး လမ်းညွှန်ချက်စံနှုန်းများအတိုင်း တိုင်းတာရယူခဲ့သော ရေနမူနာများအား PH, EC, ORP, အငံဓါတ်, နောက်ကျိမှု၊ အနည်ကျမှု၊ ရေအပူချိန်၊ လေအပူချိန်၊ အောက်ဆီဂျင်ပျော်ဝင်မှုနှင့် အစိုင်အခဲပျော်ဝင်မှုတို့ကို အသိအမှတ်ပြုဓါတ်ခွဲခန်းတွင် စနစ်တကျပေးပို့လျှက် စစ်ဆေးပြီးမှတ်တမ်းများရယူခဲ့ပါသည်။ စစ်ဆေးတိုင်းတာချက်အရ နေရာအားလုံးတွင် PH ပါဝင်မှုသည် ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့မှ သတ်မှတ်ထားသည့်စံနှုန်းထက်ကျော်လွန်မှုမရှိပါ။ စိုစွတ်ရာသီအတွင်း တိုင်းတာမှု၌ နေရာအားလုံး၌ ရေအနည်ကျမှုတွင် သတ်မှတ်စံနှုန်းထက်ကျော်လွန်နေပြီး ခြောက်သွေ့ရာသီအတွင်း တိုင်းတာရာတွင် မြစ်အထက်ပိုင်းနှင့် မြစ်

အောက်ပိုင်း၌ ဖော့စဖရပ်ပါဝင်မှုသည် သတ်မှတ်စံနှုန်းထက် ကျော်လွန်နေပါသည်။ အခြားအတိုင်းအတာများ၏ မြေပြင်တိုင်းတာမှုရလဒ်နှင့် ဓါတ်ခွဲခန်းရလဒ်များကို အစီရင်ခံစာတွင် အသေးစိတ်ဖော်ပြထားပါသည်။

ခြောက်သွေ့ရာသီအတွင်း၌ မြစ်၏အနက်နှင့် မြစ်ရေစီးနှုန်းတို့ကို တိုင်းတာခဲ့ရာ မြစ်အထက်ပိုင်း (KLB-1)တိုင်းတာမှုတွင် မြစ်၏အနက်မှာ မြစ်၏မြောက်ပိုင်းတွင် (၁.၅)မီတာ၊ မြစ်အလယ်တွင် (၁၂) မီတာနှင့် မြစ်တောင်ပိုင်းတွင် (၉.၉)မီတာဖြစ်ပါသည်။ တံတားတည်ဆောက်မည့်နေရာ(KLB-2) တိုင်းတာမှုတွင် မြစ်အနက်မှာ မြစ်မြောက်ပိုင်းတွင် (၃.၈၁) မီတာ၊ အလယ်တွင်(၁၂.၈၉)မီတာနှင့် မြစ်တောင်ပိုင်းတွင် (၂.၆၂)မီတာဖြစ်ပြီး တံတားအသစ်ဆောက်မည့်နေရာ၏ အောက်ဘက်ပိုင်း(KLB-3) တိုင်းတာမှုတွင် မြစ်၏အနက်မှာ မြစ်မြောက်ပိုင်း၊ မြစ်အလယ်နှင့် မြစ်တောင်ပိုင်းတို့၌ (၅.၆)မီတာ၊ (၆.၅၈)မီတာနှင့် (၁.၃၅) အသီးသီး တိုင်းတာရရှိခဲ့ပါသည်။ မြစ်ရေစီးနှုန်းအနေဖြင့်လည်း KLB-1 နေရာရှိ မြစ်မြောက်ပိုင်း၊ အလယ်နှင့် တောင်ပိုင်းတို့၌ (၀.၁၉) မီတာ/စက္ကန့်၊ (၀.၈၆) မီတာ/စက္ကန့်၊နှင့် (၀.၀၉) မီတာ/စက္ကန့်တို့ တိုင်းတာရရှိပြီး KLB-2 တိုင်းတာမှု၌ မြစ်မြောက်ပိုင်းတွင် ရေစီးနှုန်းတိုင်းတာ၍မတွေ့ရှိရပဲ မြစ်အလယ်တွင် ရေစီးနှုန်းမှာ (၁.၂၂) မီတာ/စက္ကန့်ရှိပြီး မြစ်တောင်ပိုင်းတွင် (၀.၇၂) မီတာ/စက္ကန့်ဖြစ်ပါသည်။ တံတားအသစ်တည်ဆောက်မည့်နေရာ၏ အောက်ဘက်ပိုင်း (KLB-3)ရှိ ရေစီးနှုန်းမှာ မြစ်မြောက်ဘက်နှင့် တောင်ဘက်တွင် ရေစီးနှုန်းတိုင်းတာ၍မတွေ့ရှိရပဲ မြစ်အလယ်တွင် ရေစီးနှုန်း(၀.၃) မီတာ/စက္ကန့် တိုင်းတာရရှိပါသည်။

ပထဝီဝင်အနေအထားနှင့် မြေဆီလွှာအရည်အသွေး

အဆိုပြုစီမံကိန်းနှင့် ကွမ်းလုံမြို့နယ်သည် အများအားဖြင့် ထုံးကျောက်တောင်တန်းများဖြင့် ဖုံးလွှမ်းလျက်ရှိသည်။ အပေါ်ယံမြေဆီလွှာသည် အနီရောင်ရှိသည့် သဲဆန်သောမြေလွှာဖြစ်ပြီး ထုံးကျောက်များဖြင့် ရောနှောလျက်ရှိသည်။ ဟင်းသီးဟင်းရွက်ပင်များ ပျံနှံ့ပေါက်ရောက်မှု၊ စိုက်ပျိုးအလေ့အကျင့်များနှင့် မြေဆီလွှာအမျိုးအစားများပြောင်းလဲနေမှုကို အခြေခံ၍ တံတားတည်ဆောက်ရေးစီမံကိန်းပတ်ဝန်းကျင်တွင် နေရာ(၄) နေရာသတ်မှတ်၍ မြေနမူနာရယူခဲ့ပါသည်။ မြေဆီလွှာတွင် ဓါတ်သတ္တုများနှင့် အော်ဂဲနစ်ပါဝင်မှုဟူ၍ (၂) မျိုးကွဲပြားစွာတွေ့ရပြီး Cadmium၊ Copper၊ Lead၊ Nitrogen၊ Phosphorous၊ Potassium၊ နှင့် pH တို့ကိုလဲ စမ်းသပ်စစ်ဆေးခဲ့ရာ (၂)ရာသီလုံးတွင် သတ်မှတ်စံနှုန်းထက် ကျော်လွန်ခြင်းမရှိကြောင်း တွေ့ရပါသည်။ မြေဆီလွှာစစ်ဆေးချက် ရလဒ်အသေးစိတ်ကို ဇယား(၃၀-၃၁) တွင် ဖော်ပြထားပါသည်။

သဘာဝဘေးအန္တရာယ်

မြန်မာနိုင်ငံသည် လွန်ခဲ့သော (၁၀)နှစ်ကျော်ကာလအတွင်း အဓိကငလျင်(၂)ခု၊ ပြင်းထန်သောမုန်တိုင်း(၃)ခု၊ ရေလွှမ်းမိုးများမှုများနှင့် အခြားဘေးအန္တရာယ်များ ဖြစ်ပေါ်ခဲ့သည်။ သဘာဝဘေးအန္တရာယ်စီမံခန့်ခွဲရေးဌာန၏ မှတ်တမ်းများအရ စီမံကိန်းတည်နေရာသည် မကြာသေးမီနှစ်များအတွင်း ရေလွှမ်းမိုးမှုများကို ကြုံတွေ့ခဲ့ခြင်းမရှိပါ။ မြန်မာနိုင်ငံ၏ ငလျင်ဇုန်သတ်မှတ်ချက်အရ

စီမံကိန်းတည်နေရာသည် ငလျင်လှိုင်းအရှိန် (၀.၃-၀.၄၉)အတွင်းရှိသည့် ပြင်းထန်ဇုန်အတွင်း ကျရောက်လျှက်ရှိပါသည်။

သစ်ပင်ပန်းမာန်နှင့် တိရိစ္ဆာန်များ

အဆိုပြုလုပ်ငန်းတည်ဆောက်မည့်နယ်မြေ၏ အခြေခံသဘာဝပေါက်ပင်နှင့် ကျေးငှက်တိရိစ္ဆာန်အမျိုးအစားများကို ၂၀၁၉ ခုနှစ်၊ စက်တင်ဘာလတွင် စီမံကိန်းသက်ရောက်မှုဇရိယာအတွင်း၌ ကွင်းဆင်းလေ့လာမှတ်တမ်းကောက်ယူခဲ့ပါသည်။ အဆိုပြုစီမံကိန်းတည်ရှိရာနေရာ၏ ဘေးပတ်လည်တွင် ရာဘာစိုက်ခင်း၊ ပြောင်းဖူးစိုက်ခင်း၊ ဝါးပင်၊ မယ်ဇလီပင်၊ သစ်အယ်ပင်နှင့် လောက်ယားပင်တို့ကို အများဆုံးတွေ့ရပါသည်။ ကွမ်းလုံမြို့နယ်အတွင်း ကာလကြာရှည်နေထိုင်ကြသည့်ဒေသခံများနှင့် စီမံကိန်းသက်ရောက်မှုဇရိယာ တစ်လျှောက်ရှိ တောလိုက်မုဆိုးများနှင့် ငါးဖမ်းသမားများကိုလည်း မေးမြန်းလျှက် အချက်အလက်များ မှတ်တမ်းရယူခဲ့ပါသည်။ အဆိုပါ ကွင်းဆင်းလေ့လာခဲ့သည့်မှတ်တမ်းများအရ စိုစွတ်ရာသီတွင် နေရာ(၁)နေရာစီ၌ အပင်မျိုးပေါင်း (၁၂)ပင်မှ (၂၄) ထိ တွေ့ရှိရပြီး ခြောက်သွေ့သောရာသီတွင်လည်း အပင်မျိုးပေါင်း (၂၄)မျိုးထိ တွေ့ရှိခဲ့ရပါသည်။ အပြည်ပြည်ဆိုင်ရာသဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းစောင့်ရှောက်ရေးမှ သတ်မှတ်ထားသော အမျိုးအစား စားရင်းကို အခြေခံ၍ သစ်ပင်ကြီး၊ သစ်ပင်ငယ်၊ ချုံပင်၊ ဆေးဖက် ဝင်အပင်၊ ချုံနွယ်ပင်၊ ဝါးနှင့် မြက်ဟူ၍ အုပ်စုခွဲခြားသတ်မှတ်ထားပါသည်။ ကွင်းဆင်းလေ့လာရာတွင် စိုစွတ်ရာသီ၌ တိရစ္ဆာန်မျိုးပေါင်း ကျေးငှက် (၂)မျိုး၊ လိပ်ပြာနှင့် ပိုးဖလံမျိုးရင်းဝင်(၃၂)မျိုးနှင့် အင်းဆက်ပိုးမွှား (၆)မျိုးတွေ့ရှိရပြီး ခြောက်သွေ့ရာသီ၌ လိပ်ပြာနှင့် ပိုးဖလံ မျိုးရင်းဝင်(၆)မျိုးနှင့် သံလွင်မြစ်ကြောင်းတလျှောက် လေ့လာမှုအရ ငါးအမျိုးအစားပေါင်း (၁၄)မျိုးကို တွေ့ရှိရပါသည်။ စီမံကိန်းဒေသပတ်ဝန်းကျင်ရှိ တောလိုက်မုဆိုးများ၏ ပြောဆိုမှုများအရ နို့တိုက်သတ္တဝါများ၊ ကင်းခြေများနှင့် ပိုးနားသန်ကောင်းများအပါအဝင် သားရဲတိရစ္ဆာန်ပေါင်း(၂၂)မျိုးမှာ စီမံကိန်းပတ်ဝန်းကျင်ရှိ တောင်စွယ်တောင်တန်းများပေါ်ရှိ သဘာဝပေါက်ပင်များအကြား ရှင်သန်ကျက်စားနေထိုင်လျှက်ရှိကြောင်း သိရှိရပါသည်။

စီမံကိန်းသက်ရောက်မှုဇရိယာအတွင်းရှိ ဒေသခံများ၏ လူမှုစီးပွားရေး

စီမံကိန်းနယ်မြေပတ်ဝန်းကျင်ရှိ ဒေသခံများ၏ လူမှုစီးပွားရေးဆိုင်ရာ ကနဦးလေ့လာဆန်းစစ်ချက်များကို ၂၀၁၉ ခုနှစ်၊ အောက်တိုဘာလတွင် ပြုလုပ်ခဲ့ပြီး လူမှုစီးပွားရေးအခြေအနေများ၊ ကာကွယ်စောင့်ရှောက်ပေးရမည့်အရာများ၊နှင့် စီမံကိန်းကြောင့် ဒေသခံပြည်သူများအပေါ် သက်ရောက်စေမည့် ကောင်းကျိုး၊ ဆိုးကျိုးများကို ကွင်းဆင်းလေ့လာကောက်ယူခဲ့သည်။

ကွမ်းလုံမြို့နယ်တွင် ယခုလက်ရှိနေထိုင်ကြသော အိမ်ထောင်စု (၅၇၅၀၁) စုတွင် မြို့နေလူဦးရေမှာ (၅၈၃၇) ဦးနှင့် ကျေးလက်နေလူဦးရေမှာ (၅၁၆၆၄)ဦး တို့ဖြစ်ပါသည်။ ကွမ်းလုံမြို့နယ်အတွင်း အများစုနေထိုင်ကြသော လူမျိုးများမှာ ကိုးကန့်လူမျိုးဖြစ်ပြီး ကျန်လူမျိုးစုများမှာ ကချင်၊ ဝ(လွယ်လ)၊ မြောင်ဇီး၊ ရှမ်း၊ ဗမာနှင့် အခြားလူမျိုးစုတို့ ဖြစ်ကြသည်။ စီးမံကိန်းသက်ရောက်နယ်များတွင် အများစု

မှာ ဗုဒ္ဓဘာသာကို ကိုးကွယ်ယုံကြည်ပြီး၊ ကျန်လူမျိုးများမှာ ခရစ်ယာန်၊ ဟိန္ဒူ၊ အစ္စလာမ်နှင့် အခြားဘာသာဝင်များဖြစ်ကြသည်။ ကွမ်းလုံမြို့နယ်၏ အဓိကစိုက်ပျိုးသီးနှံမှာ မိုးစပါးဖြစ်ပြီး၊ ကြံ၊ နှမ်း(မိုး)နှင့် အခြားသီးနှံများ စိုက်ပျိုးကြသည်။ စုစုပေါင်း ထိမ်းသိန်းထားသောသစ်တောဧရိယာ (၈၀၂၈) ဧကရှိပြီး စီးပွားဖြစ်သစ်တောစိုက်ခင်းတွင် ကျွန်းသစ်အပါအဝင် (၈၁၅)ဧကရှိပါသည်။ ကွမ်းလုံမြို့တွင် အလုပ်အကိုင်ရရှိမှုနှုန်းမှာ (၉၈) ရာခိုင်နှုန်း ဖြစ်သည်။

ဟိုလီကျေးရွာအုပ်စုတွင် အိမ်ခြေ (၃၂၀) ရှိပြီး၊ လူဦးရေစုစုပေါင်း (၂,၀၀၀)ဦး ရှိသည်။ ဟိုလီကျေးရွာအုပ်စုရှိ ခိုက်ပန်ရွာတွင် အိမ်ထောင်စု (၁၈)စုတွင် လူဦးရေ (၈၀) ဦးရှိသည်။ တံတားဦး ကျေးရွာတွင် အိမ်ထောင်စု (၁၂၀) စု၊ နှင့် တုန်ကြတ်ကျေးရွာတွင် အိမ်ထောင်စု (၂၇၀) စုရှိပြီး စုစုပေါင်း လူဦးရေမှာ (၁၆၅၃) ဦးရှိသည်။ ဟိုလီကျေးရွာနှင့် ခိုက်ပန်ကျေးရွာများတွင် ခရစ်ယာန်ဘာသာကို အများစုကိုးကွယ်ယုံကြပြီး၊ တုန်ကြတ်နှင့် တံတားဦးကျေးရွာများတွင် ဗုဒ္ဓဘာသာကို အများစုကိုးကွယ်ယုံကြည်ကြသည်။ ယေဘူယျအားဖြင့် လူဦးရေ၏ ရာခိုင်နှုန်းအများစုမှာ အခြေခံပညာအထက်တန်းအောင်မြင်ပြီးသူများဖြစ်ကြပြီး အနည်းစုမှာ အတန်းပညာတက်ရောက်သင်ကြားခြင်းမရှိပါ။

ကျေးရွာ(၄) ရွာရှိ အိမ်ခြေအများစုမှာ တစ်လဝင်ငွေ ကျပ် (၁၀၀,၀၀၀) မှ ကျပ် (၄၀၀,၀၀၀) အထိ ရရှိပါသည်။ ကျေးရွာ (၄) ရွာရှိ အိမ်ထောင်စုအားလုံးမှာ ကိုယ်ပိုင်အိမ်များပိုင်ဆိုင်ကြသည်။ လူမှုဖူလုံရေးအဖွဲ့အစည်းကို တံတားဦးရွာတွင် တွေ့ရှိရပြီး ဟိုလီကျေးရွာတွင် အမျိုးသမီးရေးရာအဖွဲ့၊ လော မောခရစ်ယာန်အဖွဲ့၊ ကချင်ဘုခရစ်ယာန်အသင်းနှင့် လူမှုဖူလုံရေးအဖွဲ့အစည်း တို့ကိုတွေ့ရှိ ရပါသည်။ ဟိုလီကျေးရွာ၊ တံတားဦးကျေးရွာနှင့် တုန်ကြတ် ကျေးရွာတို့မှာ သတင်းအချက်အလက်နှင့် ဖျော်ဖြေရေးဆိုင်ရာများအတွက် သတင်းစာ၊ တီဗွီ နှင့် လူမှုကွန်ယက်တို့ကို အဓိကထားအသုံးပြုကြပြီး၊ ခိုက်ပန်ကျေးရွာတွင်မူ သတင်းအချက်အလက်များကို လူမှုကွန်ယက်မှ အဓိကရယူအသုံးပြုသည်။ ခိုက်ပန်ကျေးရွာမှလွဲ၍ အခြားကျေးရွာများဖြစ်ကြသော ဟိုလီကျေးရွာ၊ တံတားဦးကျေးရွာနှင့် တုန်ကြတ်ကျေးရွာတို့တွင် လျှပ်စစ်ဓါတ်အားရရှိပါသည်။ သို့သော် နေ့စဉ်သုံးလိုအပ်ချက်အရ ဘတ်ထရီနှင့် ဆိုလာပြား အသုံးပြုမှုများလည်းရှိပါသည်။ ရွာအားလုံးတွင် ၎င်းတို့၏ ရေလိုအပ်ချက်အတွက် ချောင်းငယ်(သို့မဟုတ်) စမ်းချောင်းတို့မှ ရေကို အဓိကအသုံးပြုကြ အချို့မှာ စိမ့်စမ်းရေနှင့် အဝိစီတွင်းရေတို့မှ ရေကို မှီခိုအသုံးပြုကြသည်။

ပတ်ဝန်းကျင်နှင့် လူမှုဘဝစီမံခန့်ခွဲခြင်း အစီအစဉ်

ဖြစ်နိုင်ခြေရှိသည့် ပတ်ဝန်းကျင်နှင့်လူမှုစီးပွားရေးဆိုင်ရာသက်ရောက်မှုများကို လျှော့ပါးသက်သာစေရန်နှင့်ထိခိုက်မှုအနည်းဆုံးဖြစ်စေရန် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး(ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်ရှိ စံချိန်စံညွှန်းများနှင့်အညီ ပတ်ဝန်းကျင်နှင့် လူမှုဘဝစီမံခန့်ခွဲခြင်းအစီအစဉ်ကို အကောင်းဆုံးစီမံခန့်ခွဲမှုနည်းလမ်းများဖြင့် စီမံကိန်းကာလအလိုက် (တည်ဆောက်ရေးအကြိုကာလ၊ တည်ဆောက်ရေးကာလ၊ လုပ်ငန်းလည်ပတ်မှုကာလ၊ လုပ်ငန်းရပ်တန့်မှုကာလ) ရေးဆွဲထားပါသည်။ အဆိုပြုစီမံကိန်း၏ စီမံကိန်းအဆင့် (၄) ဆင့်အတွက် အလားအလာရှိသော ပတ်ဝန်းကျင်နှင့် လူမှုရေး

ဆိုင်ရာသက်ရောက်မှုများ၏ ဒီဂရီအဆင့်အလိုက် အရေးပါမှုတို့ကို နှံနှံစပ်စပ်လေ့လာဆန်းစစ်တင်ပြထားပါသည်။ စီမံကိန်းလုပ်ငန်းစဉ်အဆင့်ဆင့်တွင် တွေ့ရှိရနိုင်သော သိသာထင်ရှားသည့် သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားရေးဆိုင်ရာ သက်ရောက်မှုများမှာ အောက်ပါအတိုင်းဖြစ်ပါသည်။

စီမံကိန်းကာလအလိုက် ဖြစ်နိုင်ခြေရှိသည့် ပတ်ဝန်းကျင်နှင့် လူမှုဘဝ ထိခိုက်နစ်နာမှုများမှာ-

တည်ဆောက်ရေးအကြိုကာလအတွင်းရှိ ပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက်မှုများ

- ကွင်းဆင်းတိုင်းတာ မြေရှင်းလင်းရာ၌ သဘာဝပေါက်ပင်များနှင့် တိရိစ္ဆာန်မျိုးစိတ်များ အပေါ် သက်ရောက်မှုများ၊
- စီမံကိန်းလမ်းကြောင်းတလျှောက် အပင်နှင့်သစ်ပင်ကြီးများအား ဖယ်ရှားရှင်းလင်းခြင်းနှင့် မြေပြင်ညီညာအောင်ဆောင်ရွက်ခြင်းလုပ်ငန်းများကြောင့် အပေါ်ယံမြေလွှာများ ပျက်စီးဆုံးရှုံးမှုဖြစ်ပေါ်စေ၍ မြေဆီလွှာတိုက်စားမှုဖြစ်ခြင်း၊
- အပေါ်ယံမြေလွှာအား တူးဆွခြင်းကြောင့် ဖုန်မှုန့်များထုတ်လွှင့်မှု အနည်းငယ်ဖြစ်ပေါ်လာခြင်း၊
- မြေသားလုပ်ငန်းများဆောင်ရွက်ရာမှတူးမြေများနှင့် သစ်ပင်များနှင့်ချုပုပ်များ ခုတ်ထွင်ရှင်းလင်းရာမှ အပင်အကြွင်းအကျန်များ

တည်ဆောက်ရေးကာလအတွင်း ဖြစ်နိုင်ခြေရှိသည့် ပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက်နစ်နာမှုများ

- တံတားတည်ဆောက်ရန် သံလွင်မြစ်အတွင်း အုတ်မြစ်ချလုပ်ငန်းများဆောင်ရွက်မှုကြောင့် ရေစီးကြောင်းများ လမ်းကြောင်းအမျိုးမျိုးခွဲထွက်စေပြီး မြစ်ရေစီးကြောင်းများ တလှည့်စီ ယာယီပြောင်းလဲမှုဖြစ်ပေါ်စေခြင်း၊
- မြေပြင်ရှင်းလင်းခြင်းကြောင့် သဘာဝပေါက်ပင်များနှင့် တိရိစ္ဆာန်မျိုးစိတ်များ ပျက်စီးဆုံးရှုံးခြင်း၊
- ဆောက်လုပ်ရေးလုပ်ငန်းသုံး ပစ္စည်းများအသုံးပြုမှုနှင့် လုပ်ငန်းသုံးယာဉ်များလည်ပတ်မှုစသည့် တည်ဆောက်ရေးလုပ်ငန်းအဆင့်ဆင့်မှ လေထုညစ်ညမ်းမှုကို ဖြစ်စေသည့် အခိုးအငွေ့နှင့်အမှုန်အမွှားများ ထုတ်လွှင့်မှု ဖြစ်ပေါ်စေခြင်း၊
- မြေပြုပြင်ခြင်း၊ တူးဆွခြင်းနှင့် မြေဖို့ခြင်းလုပ်ငန်းများ၊ အပေါ်ယံမြေလွှာအားလုပ်ထားခြင်းနှင့် ဆောက်လုပ်ရေးဆိုင်ရာ ပစ္စည်းကိရိယာများ အတင်အချပြုလုပ်ခြင်း၊ လုပ်ငန်းသုံးပစ္စည်းများ စုပုံထားရှိခြင်းတို့ကြောင့် ဖုန်မှုန်များထွက်ပေါ်လာခြင်း၊
- လုပ်ငန်းသုံးပစ္စည်းများ စုပုံထားရှိခြင်း၊ ဆောက်လုပ်ရေးလုပ်ငန်းစဉ်များ၊ လုပ်သားများ၏ ပြောင်းသွားလာမှု၊ ဆောက်လုပ်ရေးပစ္စည်းအပျက်အစီးများ စုပုံများပြားလာခြင်း၊ လုပ်ငန်းသုံးယာဉ်များဖြတ်သန်းသွားလာခြင်းနှင့် မြေကြီးလုပ်ငန်းများဆောင်ရွက်ခြင်းတို့ကြောင့် မြေဆီလွှာညစ်ညမ်းစေခြင်း၊ အပေါ်ယံမြေဆီလွှာတိုက်စားခြင်းနှင့် မြေဆီလွှာသိပ်သည်းကျစ်လစ်ခြင်းတို့ ဖြစ်ပေါ်ခြင်းဖြင့် မြေဆီလွှာပျက်စီးဆုံးရှုံးမှုများဖြစ်ပေါ်ခြင်း၊

- တည်ဆောက်ရေးလုပ်သားများ၊ လုပ်ငန်းသုံးယာဉ်များ ရွှေ့ပြောင်းသွားလာမှု၊ လုပ်ငန်းသုံး ပစ္စည်းကိရိယာများအတင်အချပြုလုပ်ခြင်းနှင့် မြေပြင်တူးဆွခြင်းတို့ကြောင့် ဆူညံမှုနှင့် တုန်ခါမှုများဖြစ်ပေါ်ခြင်း၊
- ဆောက်လုပ်ရေးလုပ်ငန်းများနှင့် လုပ်ငန်းသုံးပစ္စည်းများသယ်ယူပို့ဆောင်ခြင်းကြောင့် စွန့်ပစ် ပစ္စည်းအစိုင်အခဲများနှင့် ဆောက်လုပ်ရေး ပစ္စည်းအပျက်အစီးများ စုပုံများပြားလာခြင်း၊
- ဆောက်လုပ်ရေးလုပ်သားများနှင့် စီမံခန့်ခွဲမှုဝန်ထမ်းများ၏ နေ့စဉ်လှုပ်ရှားမှုကြောင့် စွန့်ပစ် ပစ္စည်းများထွက်ပေါ်လာခြင်း။

တည်ဆောက်ရေးကာလအတွင်း ဖြစ်နိုင်ချေရှိသော လူမှုရေးဆိုင်ရာသက်ရောက်မှုများ

- ဒေသခံပြည်သူလူထုနှင့် ပြောင်းရွှေ့လုပ်သားများအကြား သဘောထားကွဲလွဲမှုဖြစ်ပေါ်စေ ခြင်း၊ နှင့် အလုပ်အကိုင်အခွင့်အလမ်းများ အပြိုင်အဆိုင်ဖြစ်ပေါ်စေခြင်း၊
- အလုပ်သမားများအကြား ခွဲစားဆက်ဆံခြင်း၊ ကျားမတန်းတူအခွင့်အရေးမရှိခြင်း၊ လုပ်ငန်းခွင် ကြောင့် မသန်မစွမ်းဖြစ်ပါက အလျော်အစားအပေါ် အငြင်းပွားမှုများ၊ အလုပ်အချိန်ပို ဆောင် ရွက်ထားရှိမှုအပေါ် လုပ်ခလစာမပေးပဲ မသိကျိုးနှံပြုခြင်းများ၊
- မြေယာအငြင်းပွားမှု၊ အစီအစဉ်တကျမရှိသော ပြန်လည်နေရာချထားရေးလုပ်ငန်းများ၊ မြေ ရှင်များမှ မြေယာပိုင်ဆိုင်မှုအထောက်အထားများ ပြန်ရရှိရေးအတွက် စိုးရိမ်ပူပန်မှုများ၊
- မတော်တဆထိခိုက်မှုဖြစ်ခြင်းနှင့် လုပ်သားများကျန်းမာရေးနှင့် လုပ်ငန်းခွင်ဘေးအန္တရာယ် ကင်းရှင်းရေးအတွက် ကြိုတင်ဆောင်ရွက်သင့်သည်များ၊

လုပ်ငန်းလည်ပတ်မှုကာလအတွင်း ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများ

- လုပ်ငန်းသုံးပစ္စည်းများအသုံးပြုမှုနှင့် ပြုပြင်ထိန်းသိမ်းရေးလုပ်ငန်းများကြောင့် အနှောက်အ ယှက်ဖြစ်ခြင်းနှင့် ကျယ်လောင်သော ဆူညံမှုများ၊
- ပြုပြင်ထိန်းသိမ်းရေးလုပ်ငန်းများကြောင့် အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများနှင့် ပစ္စည်းအပျက်အစီး များ စုပုံများပြားလာခြင်း၊
- စီမံကိန်းတည်ဆောက်ရေးအနီးအနားဒေသတွင် ယာဉ်လမ်းကြောင်း ကျပ်တည်း၍ လမ်း ကြောင်း ပိတ်ဆို့မှုများ ပေါ်ပေါက်လာစေခြင်း၊

လုပ်ငန်းလည်ပတ်နေစဉ်ကာလအတွင်း လူမှုရေးဆိုင်ရာသက်ရောက်မှုများ

- လျှပ်စစ်နှင့်ပတ်သက်၍ အန္တရာယ်ရှိသော လုပ်ငန်းခွင်ဝန်းကျင်နှင့် လုပ်ငန်းခွင်တွင် ထိခိုက်မှု များနှင့် မတော်တဆဖြစ်မှုများဖြစ်ပေါ်စေခြင်း၊
- ဒေသခံပြည်သူများအား လျှပ်စစ်ဆိုင်ရာ မတော်တဆဖြစ်မှုများဖြစ်ပေါ်စေခြင်း၊
- သဘာဝဘေးအန္တရာယ်နှင့် လူတို့ကြောင့် ဖြစ်ပေါ်လာသည့် ဘေးအန္တရာယ်များ ပေါ်ပေါက် လာပါက ဖြစ်နိုင်ချေရှိသည့် အန္တရာယ်များ၊

လုပ်ငန်းရပ်တန့်မှုကာလတွင် ဖြစ်နိုင်ချေရှိသည့် ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများ

- ဖြိုချဖျက်စီးသည့်အမှိုက်များနှင့် အပျက်အစီးများမှ စွန့်ပစ်ပစ္စည်းအစိုင်အခဲများ၊နှင့် သတ္တု အပိုင်းအစများ၊

- ကွန်ကရစ်အုတ်တိုင်များနှင့် အခြေခံအဆောက်အဦးများ ဖြိုဖျက်ခြင်းမှ ထွက်ပေါ်လာသည့် အပိုင်းအစ စွန့်ပစ်ပစ္စည်းများနှင့်အမှိုက်များ သယ်ယူပို့ဆောင်ခြင်း၊
- စက်ကြီးများနှင့် ယာဉ်များအသုံးပြု၍ ဖြိုချဖျက်စီးခြင်းကြောင့် လေထုညစ်ညမ်းမှု၊ ဆူညံမှု နှင့် တုန်ခါ မှုများဖြစ်ပေါ်လာခြင်း၊

လုပ်ငန်းရပ်တန့်မှုအဆင့်တွင် ဖြစ်နိုင်ချေရှိသည့် လူမှုရေးဆိုင်ရာ သက်ရောက်မှုများ

- အခြေခံအဆောက်အဦများ ဖြိုချဖျက်စီးခြင်းကြောင့်ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်လုံခြုံစိတ်ချမှုဆိုင်ရာကိစ္စရပ်များ
- အလုပ်အကိုင်အခွင့်အလမ်းများ ဆုံးရှုံး၍ အလုပ်လက်မဲ့ဖြစ်စေခြင်း

ပြန်လည်နေရာချထားရေးစီမံချက်

ပြန်လည်နေရာချထားရေးစီမံချက်နှင့် လူနေစုတိုင်းရင်းသားလူမျိုးများအား စီမံခန့်ခွဲမှုအစီအစဉ်များသည် မြန်မာနိုင်ငံ၏ ဥပဒေရေးရာလိုအပ်ချက်အနေဖြင့် ရှိနေသော်လည်း သင့်တင့်မျှတသောစီမံကိန်းအကျိုးကျေးဇူးများကို ဒေသခံလူနေစုတိုင်းရင်းသားများနှင့် ရှားပါးလူအုပ်စုများအား ထောက်ပံ့ပေးရေးနှင့် လူနေစုတိုင်းရင်းသားများကို အကာအကွယ်ပေးရေးတို့အတွက် တံတားဦးစီးဌာနသည် ချမှတ်ထားသောမူဝါဒများနှင့်လုပ်ထုံးလုပ်နည်းများကို အခြေခံလျှက် အဆိုပါအကာအကွယ် ပေးရေးစီမံချက်များကို အကောင်အထည်ဖော်ဆောင်ရွက်မည်ဖြစ်သည်။

ထိခိုက်နစ်နာမှုများကိုလျော့ချစေရေးအတွက် ပြန်လည်နေရာချထားရေးစီမံချက်အနေဖြင့် ထိခိုက်နစ်နာဆုံးရှုံးမှုများကို အလျော်အစားပေးခြင်းများ၊ နေထိုင်မှုဘဝအခြေအနေများ ပြန်လည်နေရာချထားရေးအစီအစဉ်များ၊ အလျော်အစားပေးသည့်လုပ်ငန်းစဉ်များတွင် ပါဝင်ဆွေးနွေးအကြံပြုသည့် အစီအစဉ်များ၊ နစ်နာဆုံးရှုံးမှုဆိုင်ရာ လျော်ကြေးပေးသည့်လုပ်ငန်းစဉ်များအား အကောင်အထည်ဖော်ရေးအစီအစဉ်များနှင့် လုပ်ငန်းစဉ်တစ်ခုလုံးကို အကဲဖြတ်စောင့်ကြပ်ကြည့်ရှုခြင်းအစီအစဉ် စသည့်ဖြစ်နိုင်ချေရှိသည့်နည်းလမ်းများနှင့် အကျိုးသက်ရောက်မှုများကို အကောင်အထည်ဖော်ဆောင်ရွက်သွားမည်ဖြစ်သည်။ အဆိုပါ စီမံချက်အရ လူဦးရေပေါင်း(၂၀၀)ကျော်ကို ပြန်လည်နေရာချထားရန် လိုအပ်မည်ဖြစ်သည်။ တံတားဦးစီးဌာနအနေဖြင့် ပြန်လည်နေရာချထားရေးစီမံချက်ကို ပြည်သူလူထုအား ရှင်းလင်းချပြရမည်ဖြစ်ပြီး မြေယာဥပဒေ(၂၀၁၉) အရ မြေနှင့်သီးနှံအလျော်အစား၊ နှင့် ပိုင်ဆိုင်မှုဆုံးရှုံးများကို ထိခိုက်နစ်နာမှု မဖြစ်ခင်ကြိုတင်၍ ဆောင်ရွက်ပေးရမည်ဖြစ်သည်။ ထို့ပြင် သီးခြားမြေယာများချမှတ်ဆောင်ရွက်ပေးမှုလုပ်ငန်းစဉ်နှင့်အတူ စီမံကိန်းအကြိုကာလတွင် ထိခိုက်နစ်နာမည့်လူများကို ကူညီပေးရန်အတွက် နည်းလမ်းများကို ထောက်ပံ့ဆောင်ရွက်သွားမည်ဖြစ်သည်။

လူမှုဘဝထိခိုက်နစ်နာမှုများကိုရှောင်ရှားရန်နှင့် ကျိုးကြောင်းဆီလျော်၍ မျှတမှုရှိသောစီမံကိန်း၏ အကျိုးရလဒ်များကို ဒေသခံလူနေစုတိုင်းရင်းသားများနှင့် ရှားပါးလူအုပ်စုများအား တန်းတူညီမျှစွာ ထောက်ပံ့ပေးရန် ဦးတည်၍ လူနေစုတိုင်းရင်းသားလူမျိုးများအား စီမံခန့်ခွဲမှုအစီအစဉ်သည် အကောင်အထည်ဖော်ဆောင်ရွက်ရေးလုပ်ငန်းစဉ်နှင့်အတူ စီမံကိန်းဆောက်ရွက်မည့် တံတားဦးစီးဌာနအား အထောက်အကူပြုသွားမည်ဖြစ်သည်။ ထပ်မံ၍ တံတားဦးစီးဌာနသည် ထိခိုက်နစ်နာမှုများ အနဲဆုံး

ဖြင့် လျော့ပါးသက်သာစေရန် ဦးတည်၍ လူနေစုတိုင်းရင်းသားလူမျိုးများ၏ လူမှုစီးပွားထိခိုက်နစ်နာမှုများ အကဲဖြတ်ဆန်းစစ်ရေးကိုလည်း ဆောင်ရွက်သွားမည်ဖြစ်သည်။

လူထုဆွေးနွေးမှုအကြံဉာဏ်ရယူခြင်းနှင့်ထုတ်ဖော်ပြောဆိုခြင်း

ဟိုလီကျေးရွာ၊ ခိုက်ပန်ကျေးရွာ၊ တံတားဦးကျေးရွာနှင့် တုံကြက်ကျေးရွာတို့မှာ စီမံကိန်း သက်ရောက်မှုနယ်မြေဧရိယာအတွင်း ကျရောက်ပြီး လူထုတွေ့ဆုံပွဲကို ၂၀၁၉ ခုနှစ်၊ အောက်တိုဘာလ (၁) ရက်နေ့တွင် ဟိုလီကျေးရွာနှင့် တုံကြက်ကျေးရွာတို့တွင် အသီးသီး ပြုလုပ်ခဲ့ပါသည်။ အဆိုပါ (၂) နေရာတွင် စုစုပေါင်းတက်ရောက်သူဦးရေ (၆၂) ဦးနှင့် (၇၂) ဦးတို့ အသီးသီးတက်ရောက်ဆွေးနွေးခဲ့ပါသည်။ တံတားဦးစီးဌာနမှ တာဝန်ရှိသူ (၁) ဦး ပါဝင်တက်ရောက်နိုင်ခြင်းမရှိ၍ လမ်းဦးစီးဌာနမှ ကိုယ်စားလှယ် (၁)ဦးမှ လူထုတွေ့ဆုံဆွေးနွေးပွဲကို အကြံပေးအဖွဲ့နှင့်အတူ စီစဉ်ဆောင်ရွက်ခဲ့ပါသည်။

လူထုတွေ့ဆုံပွဲတွင် ပါဝင်တက်ရောက်သူများမှ စီမံကိန်းသက်ရောက်မှုဧရိယာအတွင်းရှိ မြေယာများ ရယူရာရေးဆိုင်ရာနည်းလမ်းများနှင့် မြေတန်ဖိုးသတ်မှုများ၊ စီမံကိန်းသက်ရောက်မှုနယ်မြေရှိ ရာဘာပင်တန်ဖိုးသတ်မှတ်မှုနှုန်းထားများနှင့် မူလပိုင်ရှင်ကို လျော်ကြေးပေးရာတွင် ပွင့်လင်းမြင်သာ၍ မျှတမှုရှိသောအလျော်အစား စသည့်သိရှိလိုသည်များကို မေးမြန်းဆွေးနွေးခဲ့ကြသည်။ ဟိုလီကျေးရွာရှိ ရွာသူ/ သားများမှ ယာဉ်လမ်းကြောင်းပိတ်ဆို့မှု၊ ယာဉ်အန္တရာယ်ကင်းရှင်းမှု၊ တံတားစီမံကိန်းကြောင့် လမ်းဧရိယာတိုးချဲ့စေနိုင်သည့်အတွက် ၎င်းတို့ကျေးရွာရှိ လူနေအိမ်များ ဖယ်ရှားပေးရမည့်အခြေအနေများ စသည့်အချက်များကို စိုးရိမ်ပူပန်နေကြောင်း တင်ပြဆွေးနွေးခဲ့သည်။ တံတားဦးကျေးရွာအနေဖြင့် ဒေသခံရွာသူ/သားများမှ လက်ရှိတံတားအဟောင်းကို ဆက်လက်အသုံးပြုနိုင်ရေးအတွက် လိုအပ်သည့် ပြန်လည်ပြုပြင်မှုများဆောင်ရွက်ပေးရန်၊နှင့် တံတားဟောင်းသည် သမိုင်းအစဉ်အလာအရ အရေးပါသည့် တံတားဖြစ်၍ ကောင်းမွန်ခိုင်ခံစေရန် ထိန်းသိမ်းဆောင်ရွက်ပေးသင့်ပါကြောင်း တင်ပြဆွေးနွေးခဲ့သည်။ ခိုက်ပန်ကျေးရွာအနေဖြင့် ၎င်းတို့၏သစ်တောနယ်မြေများအတွက် စိုးရိမ်ပူပန်လျက်ရှိပြီး စီမံကိန်းမှ သစ်တောနယ်မြေများကို ရယူအသုံးပြုရမည်ဆိုပါက ကြိုတင်၍ သဘောတူညီမှုများရယူရန်နှင့် စီမံကိန်းဖွံ့ဖြိုးတိုးတက်မှုလုပ်ငန်းစဉ်အရ ကျေးလက်လမ်းများပိုမိုကောင်းမွန်စေရေးနှင့် ၎င်းတို့ကျေးရွာတွင် လျှပ်စစ်မီးရရှိရေးတို့အတွက် တောင်းဆိုခဲ့သည်။

တုံကြက်ကျေးရွာမှ မြေယာအလျော်အစား၊ မြေယာတန်ဖိုးသတ်မှုနှင့်နှုန်းထားများ၊ စီမံကိန်းသက်ရောက်မှုနယ်မြေရှိ ကျန်ရှိသောမြေယာများကို ဆက်လက်အသုံးပြုခွင့်ရရှိရေး၊ သုသာန်မြေနေရာနှင့် ဘာသာရေးအဆောက်အဦးမြေနေရာများ ရယူရေးအငြင်းပွားမှုများ၊ စီမံကိန်းအတွက် မြေယာရယူရာတွင် ကြိုတင်ညှိနှိုင်းဆွေးနွေးခြင်း၊နှင့် လျော်ကြေးငွေလွဲပြောင်းပေးအပ်ရာတွင် ပွင့်လင်းမြင်သာမှုရှိစေခြင်း စသည့်သိရှိလိုသည်များနှင့် စိုးရိမ်ပူပန်မှုကို တင်ပြဆွေးနွေးခဲ့ကြသည်။ ကျေးရွာ(၄)ရွာမှ ပါဝင်တက်ရောက်ဆွေးနွေးသူများသည် စီမံကိန်းအကောင်အထည်ဖော်ဆောင်ရွက်ရာတွင် ဒေသခံရွာသူ/ရွာသားများအတွက် အလုပ်အကိုင်အခွင့်အရေးရရှိစေရေးကို အလေးထား၍ ထည့်သွင်းစဉ်းစားပေးရန် တောင်းဆိုခဲ့ကြသည်။ လူထုတွေ့ဆုံဆွေးနွေးပွဲတွင် တင်ပြဆွေးနွေးခဲ့သော စိုးရိမ်ပူပန်မှုများ၊

တောင်းဆိုချက်များနှင့်သိရှိလိုသည်များကို တံတားဦးစီးဌာနမှ နောက်တစ်ကြိမ်တွင် ကျင်းပပြုလုပ်မည့် လူထုတွေ့ဆုံဆွေးနွေးပွဲတွင် ဖြေရှင်းဆောင်ရွက်ပေးရန် လိုအပ်ပါသည်။

ဒုတိယအကြိမ်တွေ့ဆုံဆွေးနွေးပွဲတွင် မြေယာသိမ်းဆည်းခြင်းဆိုင်ရာကိစ္စရပ်များကို အဓိက ထား၍ ဆွေးနွေးကြသည်။ တက်ရောက်လာသူအချို့မှ ဆောက်လုပ်ရေးလုပ်ငန်းမစတင်မီ လျော်ကြေးပေးမှုဆိုင်ရာကိစရပ်များကို ပထမဦးစားပေးအနေဖြင့် လုပ်ဆောင်ပေးသင့်ကြောင်းနှင့် လျော်ကြေးပေးမည့်အချိန်ကာလနှင့်ပတ်သက်ပြီး စိုးရိမ်မှုများကို တင်ပြကြသည်။ စီမံကိန်းအဖွဲ့မှ လျော်ကြေးငွေပေးဆောင်မှုဆိုင်ရာကိစ္စရပ်ကို ပထမဆုံးလုပ်ငန်းအဖြစ်ဆောင်ရွက်ရန် စီစဉ်ပြီးဖြစ်ကြောင်းနှင့် ယခုလူထုတွေ့ဆုံဆွေးနွေးပွဲအပြီး နောက်ရက်သတ္တပတ်အနည်းငယ်အကြာတွင် စတင်လျော်ကြေးငွေပေးခြင်းကို စတင်ဆောင်ရွက်သွားလိမ့်မည်ဖြစ်ကြောင်း ရှင်းလင်းပြောကြားသွားပါသည်။ တက်ရောက်လာသူအချို့မှလည်း ၎င်းတို့ပတ်ဝန်းကျင်ဧရိယာတွင် မြေလွတ်မြေရိုင်းများ ရှားပါးမှုကြောင့် စီမံကိန်းမှ ရယူထားသောမြေယာတို့အတွက် မြေယာအစားထိုး ပေးနိုင်သည့် ဖြစ်နိုင်ချေကို တင်ပြကြသည်။ အစည်းအဝေးတက်ရောက်သူအများစုသည် လျော်ကြေးငွေသတ်မှတ်နှုန်းထားများကို မေးမြန်းကြရာတွင် လျော်ကြေးငွေနှုန်းထားသည် ကိုင်တွယ်ရန် နူးညံ့သိမ်မွေ့ပြီး ထိခိုက်လွယ်သောကိစတစ်ခုဖြစ်သည့်အားလျော်စွာ စီမံကိန်းအဖွဲ့အနေဖြင့် ရပ်ရွာလူထု ကိုယ်စားလှယ်များနှင့်ပွင့်လင်းမြင်သာမှုနှင့်တရားမျှတမှုအပေါ် အခြေခံ၍ တိုင်ပင်ဆွေးနွေးကြပြီးနောက် လျော်ကြေးငွေနှုန်းထားကို ဆုံးဖြတ်ကြမည်ဖြစ်သည်။

နစ်နာမှုအတွက် လျော်ကြေးပေးခြင်းဆိုင်ရာ နည်းလမ်းများ (GRM)

စီမံကိန်းမှ နစ်နာမှုအတွက် လျော်ကြေးပေးခြင်းဆိုင်ရာ နည်းလမ်းအနေဖြင့် တိုင်ကြားလာသည့် မကျေနပ်မှုများကို မှတ်သားထားခြင်းနှင့်ဖြေရှင်းခြင်း၊ အဖွဲ့အစည်းများနှင့် အလုပ်အမားများအတွက် ကောင်းမွန် သော ဖြေရှင်းချက်များ လုပ်ဆောင်ပေးခြင်းတို့ဖြစ်ပါသည်။ ပထမအဆင့်အနေဖြင့် GRM အတွက် တာဝန်ရှိပုဂ္ဂိုလ်အား ဒေသဆိုင်ရာစီမံကိန်းရုံးများမှ ဝန်ထမ်းများခန့်အပ်ထားမည်ဖြစ်ပြီး ဒုတိယအဆင့်အနေဖြင့် DOB မှ ဝန်ထမ်း (၂) ဦးခန့်အပ်သွားမည်ဖြစ်သည်။ ဂျီအာအမ်(GRM)မှ စိုးရိမ်ပူပန်မှုများနှင့် တိုင်းကြားမှုများရရှိလျှင်ရရှိခြင်း စုံစမ်းစစ်ဆေးမှုများ စတင်ပြုလုပ်မည်ဖြစ်ပြီး တိုင်ကြားစာလက်ခံရရှိသည့်နေ့မှစ၍ (၁၅) ရက်အတွင်း ဒေသခံများနှင့် ပူပေါင်းဖြေရှင်းဆောင်ရွက်သွားမည်ဖြစ်သည်။ အလွယ်တကူဖြေရှင်းဆောင်ရွက်နိုင်စေရန် တိုင်ကြားမှုများနှင့် အကြံပြုချက်များကို မှတ်တမ်းများထားရှိလျက် ဆက်သွယ်ရမည့် ဖုန်းနံပါတ်များနှင့် ပူးပေါင်းဆောင်ရွက်မည့် နည်းလမ်းများကိုလည်း ချမှတ်ဆောင်ရွက်သွားမည်ဖြစ်သည်။ ဂျီအာအမ် (GRM)၏ဆောင်ရွက်ချက်များနှင့် နည်းလမ်းများကို ကမ္ဘာ့ဘဏ်နှင့် သက်ဆိုင်ရာဌာနများသို့ ပေးပို့မည့် စီမံကိန်းအစီရင်ခံစာနှင့် စောင့်ကြပ်ကြည့်ရှုသည့် အစီရင်ခံစာတို့တွင် ဖော်ပြပါရှိဆောင်ရွက်သွားမည်ဖြစ်သည်။

2.0 INTRODUCTION

Kunlong bridge has been in service since 1965 connecting northern Shan State of Myanmar to China's Yunnam Province. Between November 1971 and January 1972, Burmese Army and forces from Communist Party of Burma fiercely fought 42 days-long battle to capture Kunlong bridge on the Salween (Thanlwin) River. The communist party saw the major military set-back in the battle that led to continued defeat of communist forces during this armed conflict.

Due to the old age, Kunlong suspension bridge has been encountering issues related to structural wears, durability, and stability in addition to not being able to match with the demand in the era of growing trade and transportation to and from China. All these conditions drive relevant authorities to explore other means to address these concerns.

2.1 Presentation of the Project Proponent

Myanmar and Chinese governments have signed economic and technical cooperation agreement and Memorandum of Understanding (MOU) for building a new Kunlong Bridge in Myanmar's northern Shan state with Chinese Government's grant in 2018. The project would specially facilitate the transportation of Myanmar's agricultural and livestock products to China, thus boosting the rapid development of border trade between the two countries. The bridge construction will commence in 2019-2020 fiscal year and expected completion is projected in 2021-2022.

Under the direct supervision by Director General of the Department of Bridge in the Ministry of Construction, a chief engineer will be assigned to administer and supervise the implementation of the bridge project management unit (PMU).

The information of the sole project proponent is as follow:

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2.2 Presentation of the Environmental and Social Experts

SEAM is a registered environmental and social consulting firm, working with clients to identify and address the environmental and social impacts in compliance with Myanmar regulations.

SEAM is dedicated to provide services for socially and environmentally responsible private sector development in Myanmar. SEAM is committed to the integrity of the environmental and social assessment process and constant improvement in the quality of our impact assessment conducts. SEAM monitors changes to the regulatory framework. Throughout the project cycle it will maintain close contact with the clients and communities.

The environmental and social experts' role is to develop ESIA, RAP, and EMMP, provide technical advice for developing ESMP for the project and to assist in the project's implementation of the environmental and social management program in every possible way so that the project's operational performance in terms of environmental and social aspects are fully in alignment with the requirements adopted by ECD and the implementing agency, DOB. SEAM's members are as follows:

Table 1: SEAM Team members

No	SEAM Team members	Background	Assignment in the Project
1	Mr. Josiah Bowles	M. Sc (W. engineering); Senior field specialist	Overseeing social and environmental studies, leading water quality and air quality monitoring, making inventory of loss, damages, and involuntary resettlements, developing RAP and ethnic minority management plan, drafting Scoping and TOR, formulating ESMP, and leading ESIA report drafting and proof-reading, and capacity building and training
2	Dr. Aung Shein	Dr. Engg (Mining); Mine specialist	Overseeing soil and geology surveys, drafting scoping and TOR, drafting ESMP, drafting some parts of ESIA report and proof-reading, and capacity building training
3	Daw Kaythi Soe Myint	Master of Public Health B. Sc (Hons) Zoology	Leading socio-economic surveys, conducting public consultations, and developing social assessment reports
4	U Min Zarni Aung	B. Tech (Mining); Field specialist (air quality)	Leading air quality surveys and environmental surveys, assisting development of scoping, screening, and TOR, assisting training materials development
5	U Nay Soe Tun	B. Sc (Geology); Field specialist (soil)	Leading soil quality surveys and assisting biodiversity surveys, assisting development of scoping, screening, and TOR, assisting training materials development

No	SEAM Team members	Background	Assignment in the Project
6	Daw Yin Yin Nwet	M.Sc (Agri: Econ), B.Agr.Sc, A.G.T.I (EP) Social and Public Consultation Specialist	Outline a strategy for the most efficient and meaningful consultation, organize the meeting, making assessment of social issues, developing the social assessment reports, and assisting development of scoping, screening, and TOR
7	U Than Soe	B. Sc (Math)	Conducting socio-economic surveys and assisting in public consultation,
8	U Thet Paing Oo	B.Sc. (Geology); GIS specialist	Leading GIS surveys, assisting biodiversity and soil surveys, and helping training materials development
9	Daw Su Su Mon	B.E (Chemical); Water quality specialist	Leading water quality surveys and environmental surveys, assisting training materials development
10	U Min Min Oo	B.A (Myanmar); Health and safety specialist	Health and safety policies and inspections
11	Daw Shwe Sin Htun	BE (Electronics), Diploma in Project Management (ICM)	Water Quality Field Specialist, assisting socio-economic surveys, conducting public consultations, discussions with other stakeholders, and developing social assessment reports
12	Daw Aye Phyo Phyo Khine	MBA	Legal Analysis, Social Survey and assisting social assessment report
13	Daw Mya Pwint Phyu	M. Sc (Botany)	Overseeing biodiversity studies, drafting biodiversity report, drafting ESMP for biodiversity management, and assisting in drafting ESIA report
14	U Ko Ko Maung	AGTI Civil	Civil Engineer
15	Daw Mya Pwint Phyu	M. Sc (Botany)	Overseeing biodiversity studies, drafting biodiversity report, drafting

No	SEAM Team members	Background	Assignment in the Project
			ESMP for biodiversity management, and assisting in drafting ESIA report
16	U Nay Myo Aung	B.Sc (English), AGTI(EC)	Assisting in Soil Surveying and in social economics assessment
17	U Thant	B.Sc(1st Year Botany)	Assisting in air, noise monitoring and biodiversity assessment

SEAM is located at No. (76) Myitzuthaka Street, Apine (4), Paukkone, Mingalardon,Yangon.

SEAM contact information is as follow:

Phone number: 09269410460 and 09795852122

Email: seamgroup@myseam.com

SEAM has been incorporated under the Myanmar Companies Act 1914 on May 2017 as a private company limited by shares and its company registration No. 10260923 that has been renewed every year. In compliance to the requirements from Environmental Conservation Department (ECD), SEAM has been carrying out EIA related programs with the permission from ECD with the Environmental Consultant registration certificates no.00045.

3.0 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 National Environmental Policy of Myanmar

To establish sound environment policies in the utilization of water, land, forests, mineral, marine resources and other natural resources in order to conserve the environment and prevent its degradation, the Government of the Union of Myanmar adopts the following policy:

"*The wealth of a nation is its people, its cultural heritage, its environment and its natural resources. The objective of Myanmar's environment policy is aimed at achieving harmony and balance between these through the integration of environmental considerations into the development process to enhance the quality of life of all its citizens. Every nation has the sovereign right to utilize its natural resources in accordance with its environmental policies; but great care must be taken not to exceed its jurisdiction or infringe upon the interests of other nations. It is the responsibility of the State and every citizen to preserve its natural resources in the interest of present and future generations. Environmental protection should always be the primary objective in seeking development*".

3.2 Policy and Legal Framework

3.2.1 Environmental Conservation Law (2012)

The Environmental Conservation Law (2012) is the main governing law and the principal objectives of this Law are:

a) To emerge a healthy and clean environment and to enable to conserve natural and cultural heritage for the benefits of present and future generation; and

b) To enable to manage and implement for decrease and loss of natural resources and for enabling the sustainable use beneficially.

In Section 3 of the Environmental Conservation Law (2012), it stipulates the following duties and functions and powers regarding the environmental conservation:

a) To specify categories and classes of hazardous wastes generated from the production and use of chemicals or other hazardous substances in carrying out industry, agricultural, mineral production, sanitation and other activities.

b) To prescribe categories of hazardous substances that may affect significantly at present or in the long run on the environment.

c) To promote and carry out the establishment of necessary factories and stations for the treatment of solid wastes, effluents and emissions which contain toxic and hazardous substances.

d) To prescribe the terms and conditions relating effluent treatment in industrial estates and other necessary places and building and emissions of machines, vehicles and mechanisms.

e) To lay down and carry out a system of EIA and SIA as to whether a project or activity to be undertaken by any Government department, organization, or person may cause a significant impact on the environment.

f) To manage to cause the polluter to compensate for environmental impact, cause to contribute fund by the organizations which obtain benefit from the natural environmental service system, cause to contribute a part of the benefit from the businesses which explore, trade and use the natural resources in environmental conservation works.

The Environmental Conservation Law (2012), in Section 10 also states the following environmental quality standards:

a) Suitable surface water quality standards in the usage in rivers, streams, canals, springs, marshes, lakes, reservoirs and other inland water sources of the public;
b) Water quality standards for coastal and estuarine areas;
c) Underground water quality standards;
d) Atmospheric quality standards;
e) Noise and vibration standards;
f) Emissions standards
g) Effluent standards;
h) Solid waste standards;
i) Other environmental quality standards stipulated by the Union Government.

In Section 13 of the law states that the Ministry shall, under the guidance of the Committee, maintain a comprehensive monitoring system and implement by itself or in coordination with relevant Government Departments, and organizations in the following matters:

a) The use of agro-chemicals which cause to impact on the environment significantly;
b) Transport, storage, use, treatment and disposal of pollutants and hazardous substances in industries;
c) Disposal of wastes which come out from exploration, production and treatment of minerals, industrial mineral raw materials and gems;
d) Carrying waste disposal and sanitation works;
e) Carrying out development and construction works;
f) Carrying out other necessary matters relating to environmental pollution.

3.2.2 Environmental Impact Assessment Procedure (2015)

The EIA Procedures (2015) stipulates the detail procedures to be followed by any organization or person relating to EIA in conducting the EIA process. According to Section 23 of EIA Procedure (2015), project proposal starts with the screening process and the ECD will determine the need for environmental assessment. The department will determine, considering the Articles 25 and 28, a solution to designate the project as one of the following project types:

1) An EIA type project, or
2) An IEE type project, or
3) A non IEE or EIA type project, and therefore any environmental assessment is not required to undertake.

3.2.3 Environmental Conservation Rules (2014)

The basic principles of this Rule states that how the EIA (ESIA) or IEE report should be prepared and submitted by any organization or person relating to EIA and how they are reviewed and approved by the reviewer of the Government body. Rule 58 mainly deals with how the Ministry shall form the EIA Report Review Body with the experts from the relevant Government Departments, and organizations, whereas Rule 59 mandates on how the submitted EIA report be scrutinized by the assigned personnel of the Ministry. Rule 61 states on how the Ministry may approve and reply on the EIA report or IEE report or EMP report.

3.2.4 National Environmental Policy (1994)

- To bring harmony and balance between the need for development and the necessity to conserve the environment through the integration of environmental considerations into the development process to enhance the quality of the life of all its citizens.
- It is the responsibility of the State and every citizen to preserve its natural resources in the interest of present and future generations.
- Environmental protection should always be the primary objective in seeking development.

3.2.5 Myanmar Constitution (2008)

In Section 45 of Myanmar Constitution (2008), it states that the Union shall protect and conserve natural environment. In Section 390 (b) it also highlights that every citizen has the duty to assist the Union carrying out the environmental conservation.

3.2.6 Conservation of Water Resources and Rivers Law (2006)

The Conservation of Water Resources and Rivers Law was enacted to assure protection and conservation of the natural water systems, to promote sustainable utilization of the sources, to improve navigation, and finally to contribute for the development of the country. The Ministry is tasked with implementation of these requirements and overseeing the effective utilization of all water sources to prevent wasteful acts.

3.2.7 Race and Religious Protection Laws (2015)

Combination of four laws make up Race and Religious Protection Laws signed in effect in 2015. The laws prohibit forced conversion from one faith to another and requires legal approval for interfaith marriages. In addition, the laws make it punishable to exercise monogamy in the country and prohibit extramarital affairs. The project will strictly abide these requirements.

3.2.8 Law on Health and Safety in the Workplace (2014)

The first law on safety and health in workplaces was drafted by the Ministry of Labour, Employment and Social Security and was promulgated in 2014. The law aims to prevent air and water pollution and seeks safety improvement at work sites, including fire prevention, use of personal protective equipment, and emergency preparedness for natural disasters.

3.2.9 Land Acquisition Act (1894)

It stipulates that:

a) the government holds rights to take over land provided that the compensation 'at market value' is made to the original land owners;

b) no private ownership of land is permitted and that all land must be leased from the Union State.

3.2.10 Land Acquisition Law 2019

The new land acquisition law in August 2019, requires any state agency to disseminate adequate information to affected land owners and to carry out public consultations, to pay current land price regardless of the ownership documentation, to pay specific fees for the crops and long term plants, to provide assistance to the property owners for the relocation and restarting their business, and to pay for all the cost in the compensation process. Any permanent or temporary land acquisition has to conform with the new law for any state or government project.

3.2.11 The Vacant, Fallow and Virgin Lands Management Law 2012

The Vacant, Fallow and Virgin Lands Management Law (VFVLML 2012) governs the allocation and use of virgin land (i.e., land that has never been cultivated) and vacant or fallow land (which the law characterizes as for any reason "abandoned" by a tenant). The law establishes the Central Committee for the Management of Vacant, Fallow and Virgin Lands (CCVFV), which is responsible for granting and rescinding use rights for such lands. This also outlines the purposes for which the committee may grant use-rights; conditions that land users must observe to maintain their use rights; and restrictions relating to duration and size of holdings. The Central Committee is also empowered (Chapter VII, Section 19) to repossess the land from the legitimate owner, after payment of compensation calculated based on the current value to cover the actual investment cost, for infrastructure and other special projects in the interest of the State.

3.2.12 The forest law (1992)

Provisions to conserve water, soil, biological diversity and the environment; sustain forest produce yields; protect forest cover; establish forest and village firewood plantations; sustainably extract and transport forest products.

3.2.13 The protection of wildlife, wild plant and Conservation of Natural Area Law (1994)

Provisions on the protection of fauna and flora and their habitat (including living and non-living organisms, migratory and endangered species); the conservation of natural areas; guidelines for scientific research; and the establishment of zoological and botanical gardens.

3.3 Institutional Framework

3.3.1 Myanmar National Building Code (2012)

Myanmar National Building Code specifies safe and sound installation procedures and requirements for operations of electricity supply, overhead cable installation, and substation establishment. The project will meet Myanmar National Building Code for every part of its implementation plan.

3.3.2 Bridge Law (2019)

Bridge Law has been stipulated on June 3rd, 2019 to set the standards and requirements for building a big bridge over 180 ft long. The law requires construction, inspection, maintaining, operating, and decommissioning in line with the systems and standards imposed by the ministry. In addition, safety of users and public have to be ensured by regular inspection and maintenance robustly throughout the life of the bridge. In guidance with the law, Ministry of Construction is obliged to make sure that the design is sound, and the quality meets the standards. It is also required to set the lifespan of the bridge. The ministry has the sole authority to either approve or disapprove establishment of all pipelines, transmission lines, and communication lines over the bridge and in addition, the law provides the authority for accepting and rejecting of establishments such as towers, underground pipelines, underground cables, and sand mining operations nearby a bridge. The ministry will set the weight limits for the bridge and passage permits for the marine traffic passing under the bridge.

3.3.3 Myanmar Engineering Council Law (2013)

The law was stipulated in 2013 to uphold integrity, ethics, and capacity of Myanmar engineers. The law also intends to maintain sustainability of natural resources and human resources and to minimize environmental adverse effects by application of research and development. Standards, requirements, safety, ethics, and directives would be set by the ministry for the peoples with engineering profession. The ministry allows the engineering council to take charge of licensing engineers and upholding engineering capacity to a highest quality.

3.3.4 Prevention of Hazard from Chemicals and Related Substances Law (2013)

This law was enacted in August 2013 for the safe use and disposal of hazardous chemicals. The law stipulates how potentially hazardous chemicals should be used, stored, handled, and disposed of. It also mandates the use of international standards for categorizing and labelling chemicals known as the Global Harmonize System of Classification and labelling of chemicals, which is widely used in the ASEAN countries. The main objectives of the law are:

a) To protect from being damaged the natural environmental resources and being hazardous any living beings by chemical and related substance;
b) To supervise systematically in performing the chemical and related substances business with permission for being safety;
c) To perform the system of obtaining information and to perform widely educative and research for using the chemical and related substance systematically;

d) To perform the sustainable development for the occupational health, safety, and conservation.

3.3.5 Minimum Wage Law, 2015

Myanmar recently promulgated a statutory minimum wage law on August 28, 2015. On the 19th March 2013, the Myanmar Parliament approved the 2013 Minimum Wage Bill and a new law on minimum wages (Law No. 7, dated 22 March 2013) came into effect on 4 June 2013. While a proposed general minimum wage has not been released yet, the minimum salary for workers in industrial zones was temporarily set at 56,700 kyat (about 65 USD) per month. In August 2015, National Minimum Wage Committee sets the minimum wage at 4,800 Kyat for an eight-hour workday.

3.3.6 Labour Dispute Settlement Law (28 Mar. 2012)

This Law was enacted in March 2012, for safeguarding the right of workers or having good relationship between employer and workers and making peaceful workplace or obtaining the rights fairly, rightfully and quickly by setting the dispute of employer and worker justly.

3.3.7 The Social Security Law (2012)

The Social Security Law was enacted in 2012 to support the development of the State's economy by providing security in social life and health care for workers. Workers are provided security benefits in social life and medical care by the public with insurance voluntarily. The right to receive continued medical treatment, family benefits, unemployment benefit, and the right to residency and ownership of housing after retirement are also provisioned in the law.

3.3.8 The Prevention and Control of Communicable Diseases Law (1995)

The law requires prevention by immunization to curve outbreaks of communicable diseases, inspection by health officers and notification to relevant authorities, and environmental sanitation to prevent communicable diseases.

3.3.9 National Environmental Quality (Emission) Guidelines (NEQEG)

To supplement implementation of EIA Procedure, NEQEG was stipulated in 2015. NEQEG provides clear standards to determine pollutions of all sorts from all developments. Air quality standard, noise level, and wastewater quality standard are provided in the NEQEG for every specific development. NEQEG describes that air quality standard for Bridge Project must meet "General Air Quality Standard".

a. Air Quality Standard

MONREC maintains that a project is required to preserve pre-existing air quality of a site. In accordance with the stipulated Environmental Impact Assessment Procedure (December 2015), National Environmental Quality (Emission) Guidelines (NEQEG)was adopted in late December 2015. Section 2.1.10 of the NEQEG does specify specific requirements for bridge project and therefore, the project is to follow general requirements as stated in the NEQEG.

Table 2: NEQEG Standard

Parameter	Averaging period	Guideline value in µg/m3
Sulfur dioxide (SO_2)	24-hour	20
	10 minutes	500
Nitrogen dioxide (NO_2)	1-year	40
	1-hour	200
Particulate Matter PM_{10}	1-year	20
	24-hour	50
Particulate Matter $PM_{2.5}$	1-year	10
	24-hour	25
Ozone	8-hourly daily maximum	100

Source: National Environmental Quality (Emission) Guidelines, 2015.

b. Wastewater Effluent Standards

Section 2.1 of the NEQEG acknowledges that bridge project doesn't generate wastewater effluent but still describes the specific requirements for bridge project and therefore, the project must follow the requirements stated in the NEQEG. Bridge Project specific wastewater effluent levels from the National Environmental Quality (Emission) Guidelines (29thDecember 2015) are illustrated in the following table.

Table 3: General Wastewater Effluent Quality Standards

Parameter	Unit	Maximum Concentration
Biological oxygen demand	mg/l	30
Chemical oxygen demand	mg/l	125
Oil and grease	mg/l	10
pH	S.U.[a]	6.9
Total coliform bacteria	100 ml	400
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Total suspended solids	mg/l	50

[a] Standard unit

Source: National Environmental Quality (Emission) Guidelines, December 2015.

c. Noise Quality Standard

Noise quality has to meet the guidelines value to be in compliance with MONREC's NEQEG requirements. Section 2.1.10 of the NEQEG does not specify specific requirements for bridge project and therefore, the project is to follow general requirements as stated in the NEQEG. General guidelines' value for noise levels are shown in the following table.

Table 4: National Environmental Quality (Emission) Guidelines Noise Level

Receptor	One Hour, LAeq (dBA)[a]	
	Daytime 07:00-22:00	Night-time 22:00 – 07:00
Residential/ Institutional/ Educational	55	45
Industrial/ Commercial	70	70

[a] Equivalent continuous sound level in decibels
Source: National Environmental Quality (Emission) Guidelines, 2015

d. Odor Requirement

NEQEG requires projects to control odor level not to cause disturbance to the population nearby. However, as the project has no association with odor and therefore, it will not be applicable for the project.

3.4 Project's Environmental and Social Standards

3.4.1 DOB's Environmental Policies and Standards

DOB makes commitments not only to avoid adverse environmental impacts and negative social effects from its operations but also to scale up efforts to promote environmental conservation and social developments of the communities, in which DOB provides services. The department always takes a step further from just setting good ambitions and executes concrete actions to reach these goals. Keeping the core values in mind, the department considers sustainability in all its operations, starting from selecting of raw materials, which promise minimal environmental footprints, and making the implementation that do not contribute major adverse impacts to the environment and the communities. The department seeks to enhance improvements to the environment and social development from its production process.

The department's operation will always treat air contamination emissions, suppress noise, vibration, offensive odour, clean up wastewater and dispose properly, manage various wastes, create safe and fair working conditions in the operating environment, and apply all necessary emergency response procedures to counter mishaps. Despite having no immediate pollution to air quality and water quality, the department is determined to act in a manner to reduce to very minimum possible extent.

Most importantly, the department plans to set as an example for its core environmental values and good practices to its workforce and communities through training and promotion programs to foster sustainable environmental improvements for other line ministries.

3.4.2 Social Policies and Standards

The department's social policies go hand in hand with Myanmar's existing laws and regulations. Myanmar's minimum wage law and prohibition of child labour will be respected in the implementation and any of the operations. Appropriate wages and opportunities will be offered commensurate to the technical qualifications. The department abides non-discrimination policy in its operations and promotes equal opportunity for both sexes. The department is an equal opportunity employer. With strong endorsement to promote gender equality, the department will never condone discrimination based on gender. Opportunities will be equally available for women and in addition, some preference will be offered to woman candidates for some positions in the implementation programs.

Overtime fees as defined by the government of Myanmar will be provided for any overtime work. Personal Protective Equipment (PPE) will be provided adequately and all employees will be obliged to wear PPE at work without exception. The department is committed to provide safe and sound working environment for all employees and all work-related health and safety regulations will be strictly enforced. In addition, regular health and safety training will be offered annually to keep the employees informed. The department has set up a system to address grievances and a committee involving representatives from the management and workers will redress every case of grievance.

3.4.3 Fire Safety

The department has put in place all fire safety procedures, measures, and equipment. It has been working closely together with fire department to get compliance certificate. Fire extinguishers, emergency exits, emergency lights and alarms, fire escape plans, and safe assembly point are established in the project implementation unit and its operations. Emergency drills are planned incorporating rapid relocation of employees from danger zones, head counts process for not leaving anyone behind, and rapid response and intervention together with the nearby fire department to extinguish the fire. In addition, local fire department will make regular inspection and certify the department's fire safety plan. Fire extinguishers will be annually inspected, and certification renewal process will be activated annually. Moreover, fire safety training will be offered regularly to all staff. Everyone in the project will be informed of the assembly point and will have to take part in the fire drills.

3.4.4 International Standards and Guidelines

IFC and World Bank Standards Applied

The project will not only meet the requirements from Myanmar National EIA requirements but also will conform to the requirements from IFC and the World Bank especially for environmental and social assessment and resettlement action plan for land acquisition when the need arises.

The project's environmental policy makes commitments to meet IFC's PS1 "Assessment and Management of Environmental and Social Risks and Impacts" and the World Bank's OP 4.01 "Environmental Assessment". IFC's PS 2 "Labour and Working Conditions", PS 3 "Resources Efficiency and Pollution Prevention", and PS 4 "Community Health, Safety, and Security" are also complied. By doing so, the project has conducted environmental and social assessments including prior informed consultations were conducted ahead of the construction process. Environmental and Social Management Plan (ESMP) based on the findings from these assessments and public consultations were developed as operation guidelines. The project is determined to be in conformity with the guidelines from the ESMP.

In addition to the environmental policies, the project rigorously follows IFC's PS 5 "Land Acquisition and Involuntary Resettlement" and the World Bank's OP 4.12 "Involuntary Resettlement". The project has made sure that land acquisition will be made in proper transition for its project and that no involuntary resettlement was involved. Moreover, the issue will be explained to the general public early in advance and solutions together with all stakeholders' active participation will be sought for all land acquisitions when the need arises.

4.0 PROJECT DESCRIPTION AND ALTERNATIVES

4.1 Project Background

Since early 2018, China has pledged to support a new Kunglon bridge that is about 323 meters in length with 3.9 Km linking road to boost the trade and transportation between northern Shan State, China's Yunnam Province, and the central areas of Myanmar. Under an economic and technical cooperation agreement, China pledges roughly US$ 148 million for socioeconomic development projects. Amid Chinese proposed 30 Projects including building of three border economic cooperation zones in Shan and Kachin States, only 9 so far sealed approvals from Myanmar. The new Kunglon bridge will be built with the Chinese grant and it is expected to be 90 million Yuan or nearly 13 million US$.

The new bridge plans to foster trade, economic cooperation, and transportation between Myanmar's northern Shan State and Yunnam Province of China. Kunlong bridge links Chinshwehaw – Kunlong – Theinni road and ultimately an important feature to reach to Lashio. The old and worn out Kunglon bridge, which has two lanes and 40-ton load capacity in its original state, has served since 1965. With the demand more lanes for higher number of traffic in the improving trade and more stable load bearing, the new bridge becomes necessity for the Department of Bridge. Department of Bridge (DOB) will administer the new Kunlong Bridge Project.

The new Kunlong Bridge will be situated on the Salween River at 49/1 Mile, 3 KM upstream of the existing bridge in Kunlong. The project will involve building of 323-meter-long with 12 m span bridge and nearly 4Km long with 8.5 m span approach road. The length of main bridge will be 260 meters. The new bridge will support 2 lanes on each direction. The new bridge project will consist of a river crossing bridge, approach roads, drainage and retaining wall structures for soil stabilization applications, traffic control systems, and safety features. Balanced Cantilever type box girder bridge will be installed. The design of new Kunlong bridge was shown in *Figure 1*, *Figure 2* and *Figure 3* shows the overview map and site layout map for the construction of new Kunlong bridge.

Department of Bridge plans to start the construction of the new bridge in 2019-2020 fiscal year and the construction period will take approximately 24 months. The Projected budget for the bridge is estimated nearly US$ 13 million. The estimated completion of the bridge is in 2021-2022 fiscal year. Number of job opportunities created for the local communities will be huge but exact computation is still in development. Due to the consequence of Coronavirus outbreak and compounded result in delays of the program in selecting contractor, the project's detail schedule for the construction and the approach road could not be confirmed. However, the DOB will update the information to ECD as soon as it becomes available.

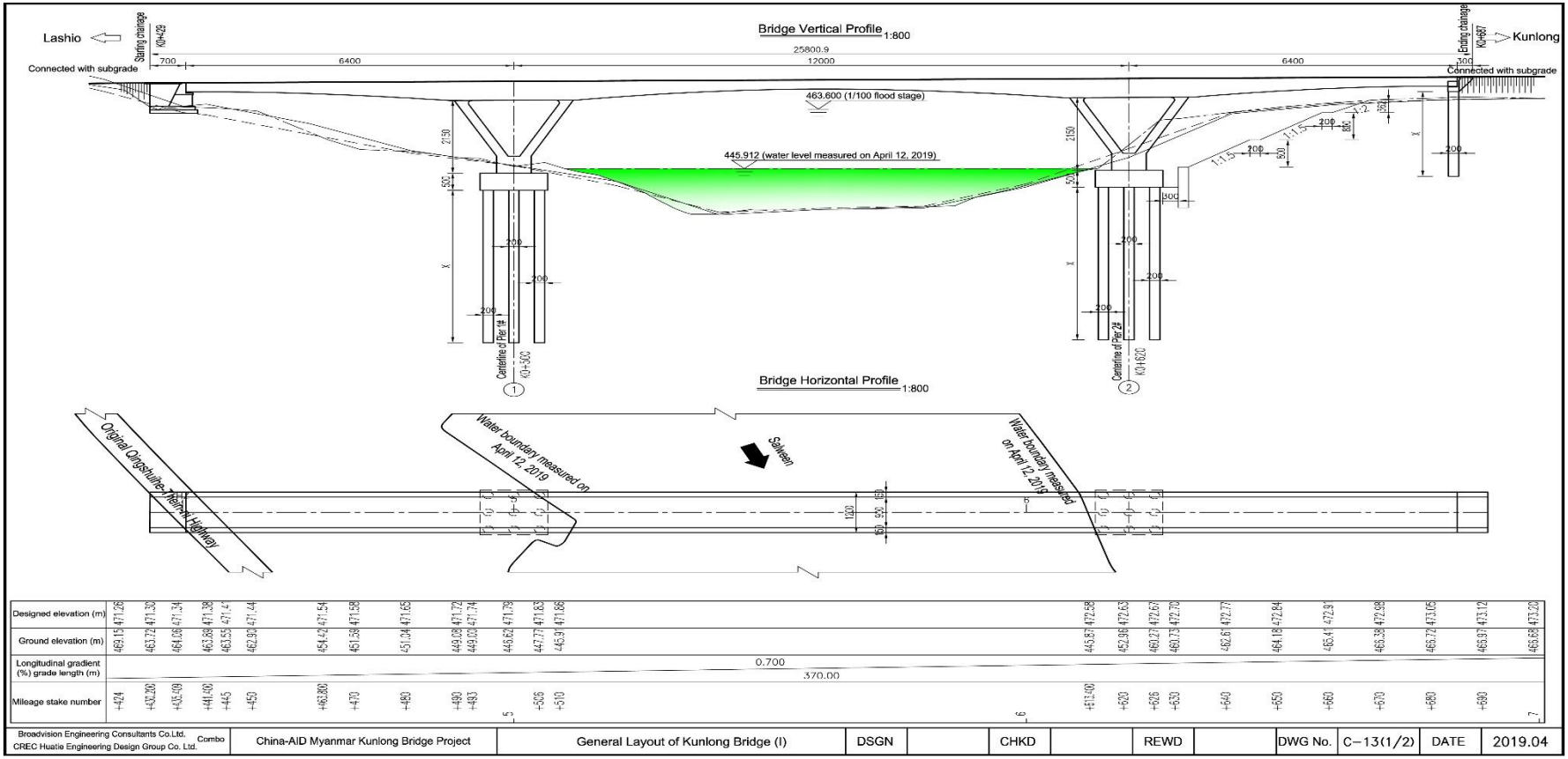


Figure 1:The design of the new bridge

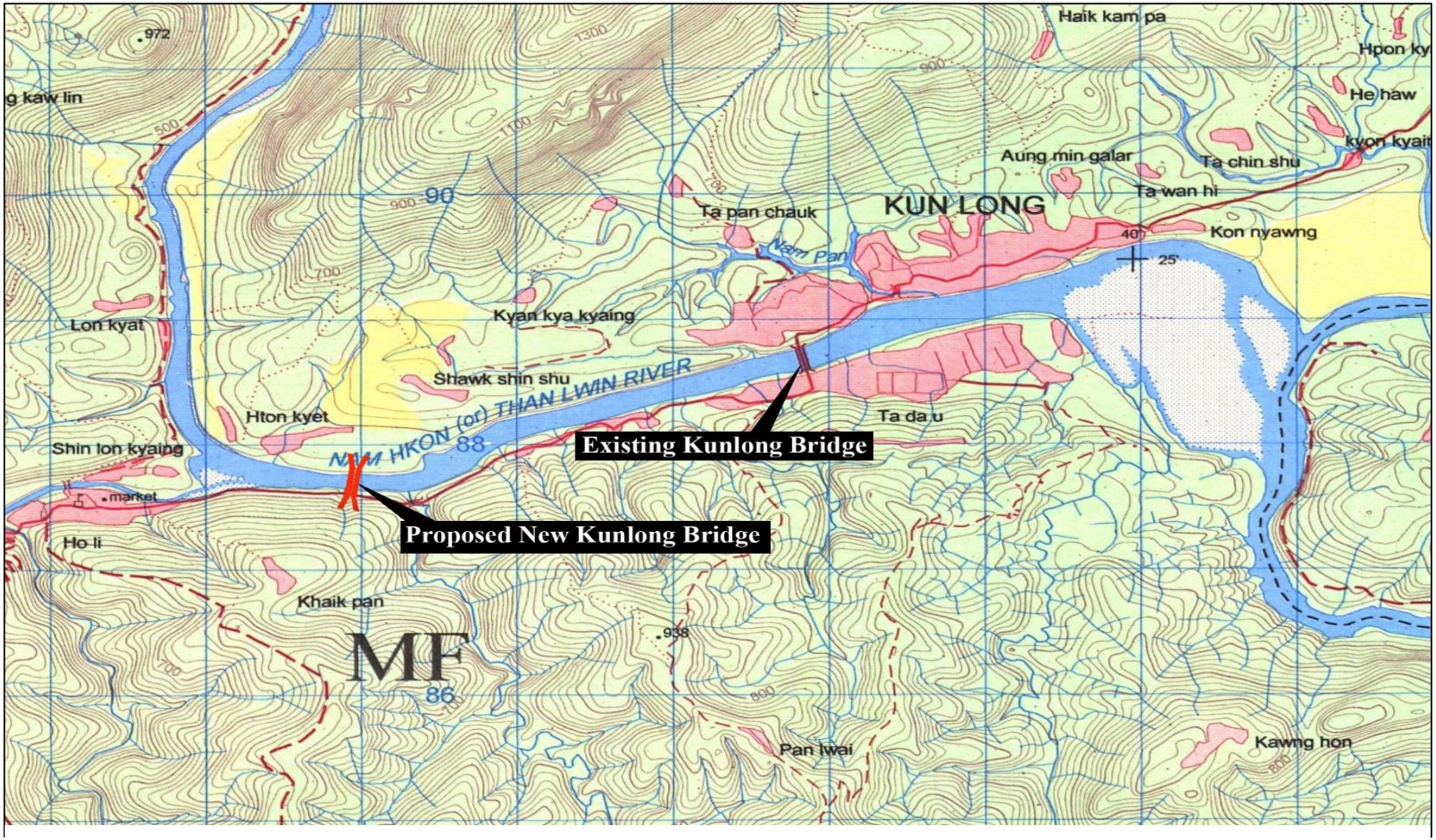


Figure 2: Overview map of New Kunglon Bridge Project

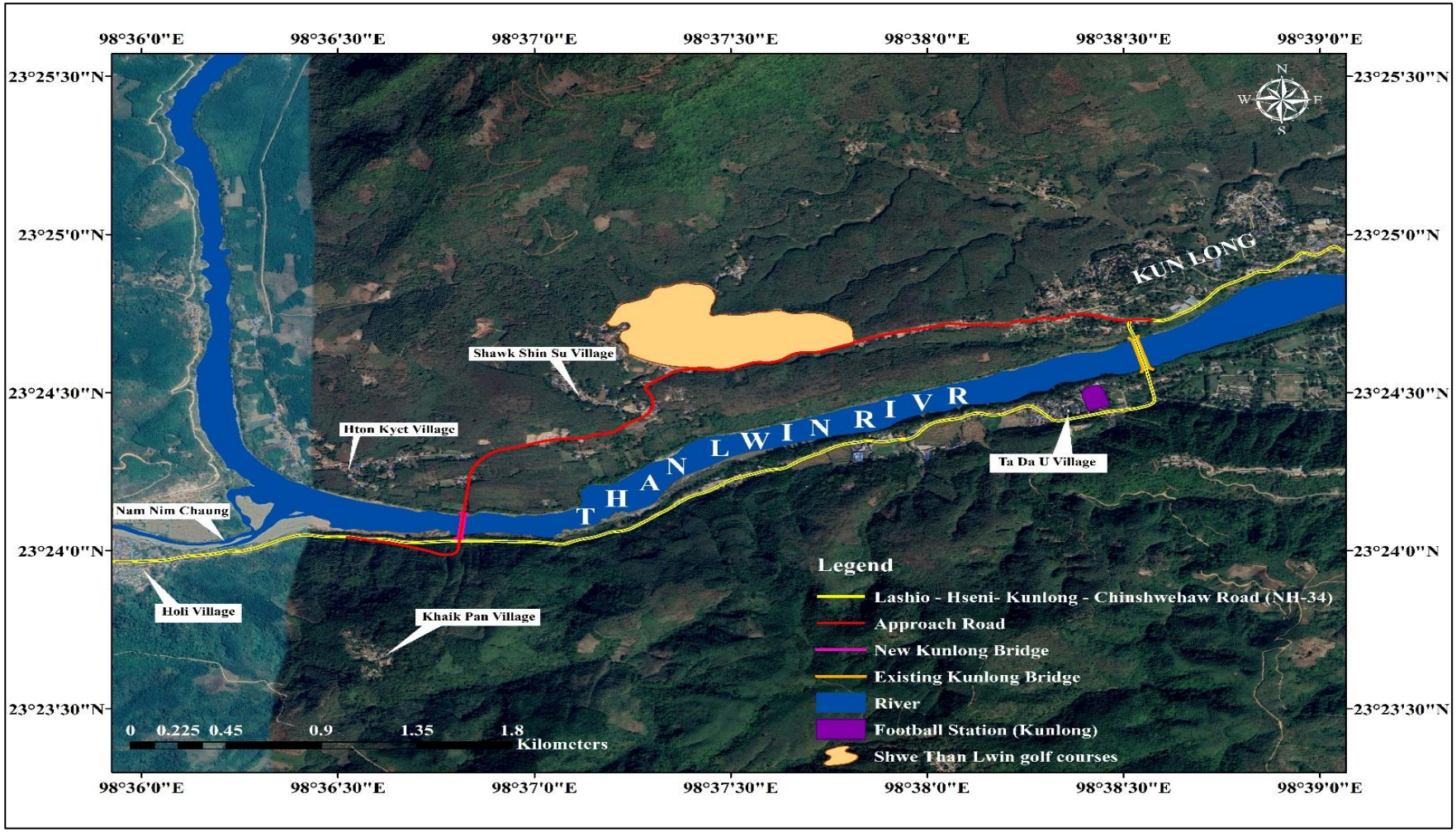


Figure 3: Site Layout map

4.2 Project Implementing Department and Project Management Unit (PMU)

The new Kunglon bridge construction will be implementing under the direct supervision by Director General of the Department of Bridge in the Ministry of Construction. And a chief engineer will be assigned to administer and supervise the implementation of the bridge project management unit (PMU). The organization chart of the project implementing department and its project management unit will be seen in the following figures.

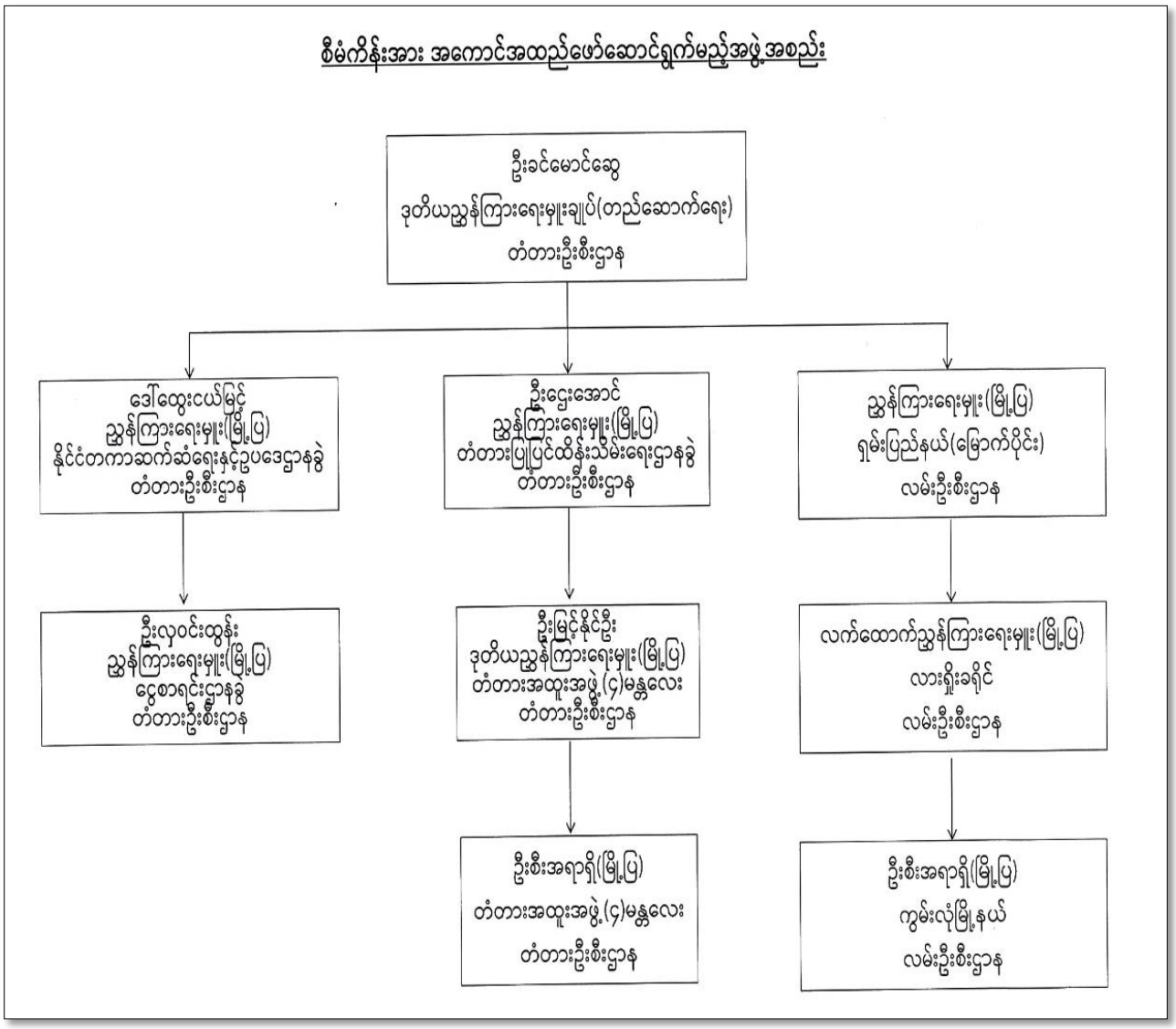


Figure 4: Organization Chat of Project Management Unit (PMU)

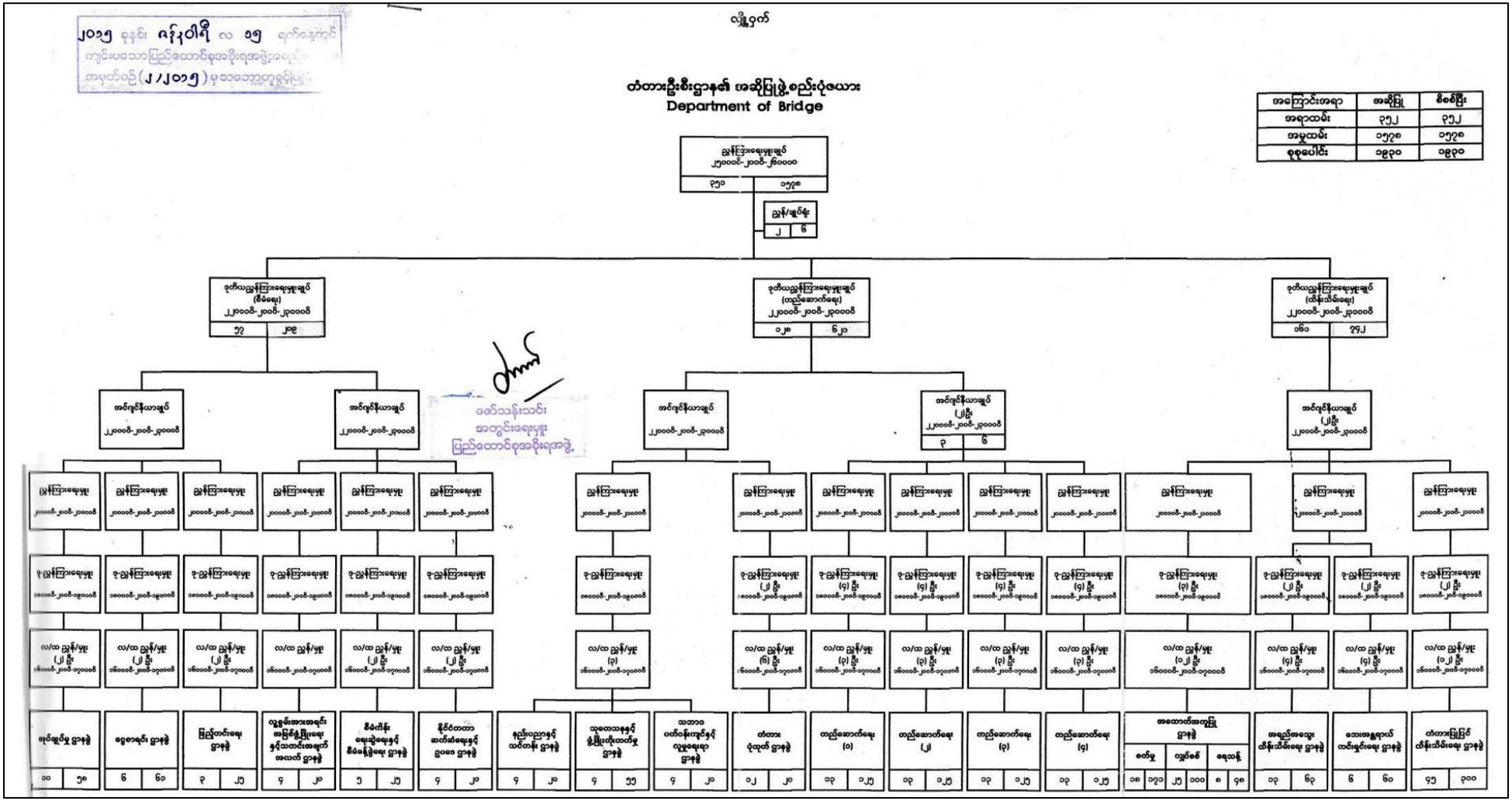


Figure 5: Organization Chat of Department of Bridge (DOB)

In order to facilitate the activities in the implementation of the bridge construction and to be the well and great quality bridge, the experts and skill labor will be utilized from Department of Bridge as well as from China in which the local experts has been mentioned in the project management unit. The detail information of the experts from the contractor of China side were not currently available due to the closure as an immediate outcome of Coronavirus disease (COVID-19) outbreak. The location of land acquisitions in the project affected area could be seen in the following figure. The compensation lists for the land acquisitions in the project affected areas were shown in Annex 11.13 and the recorded photos for giving compensation to the affected persons were also attached with it.

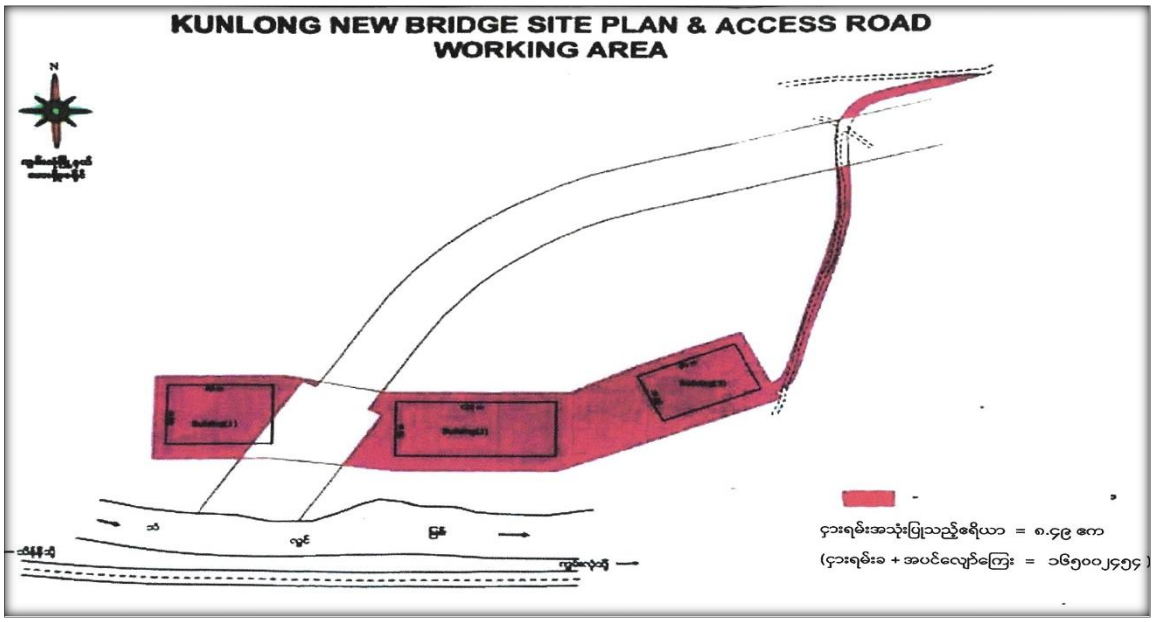


Figure 6:Location Map for the hired land in Kunlong new bridge site plan and access road working area

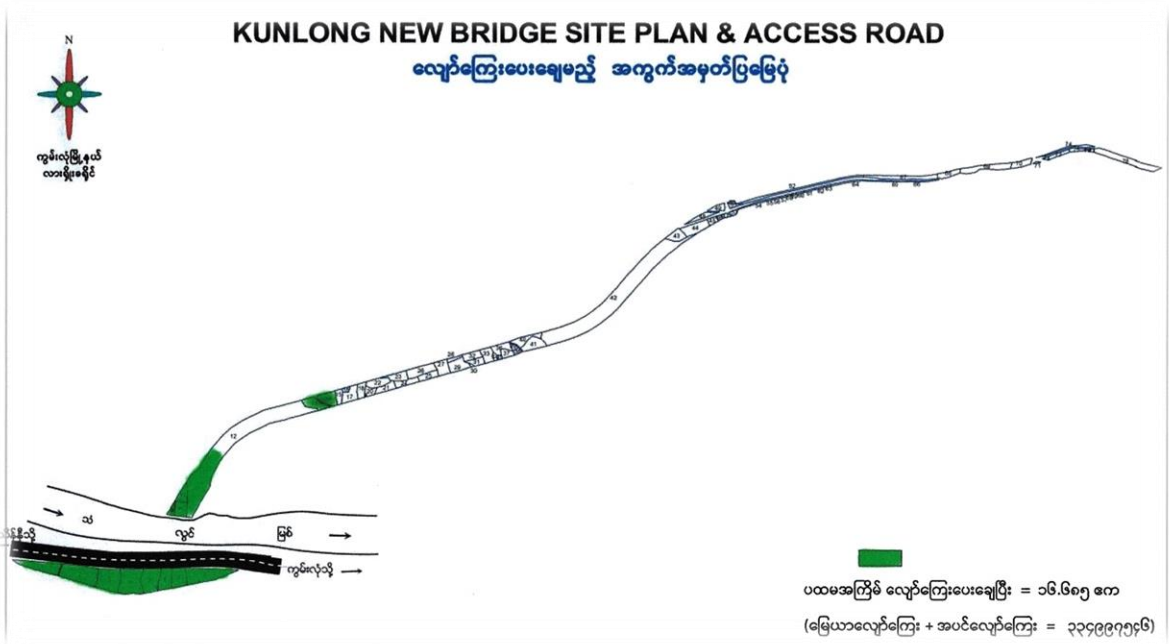


Figure 7: Location Map for land acquisitions of Kunlong new bridge site and access road

4.3 Construction Process of Kunglon Bridge

One of the most popular bridge construction methods, Balanced cantilever type, box girder bridge will be built in sequence. After setting the alignment and clearing the site, approach roads will be installed. At the same time, deep foundations at the locations of supports will be established by laying piles till to the consistent ground.

Construction of supports simultaneously on both sides of the shores will be erected afterward. To form a cantilever structure using staged cast-in-situ construction without temporary support, a structure will be built outward from the fixed support and the two opposing cantilever structures erected in the same step is known as balanced cantilever. Segments are progressively cast on site in their relevant positions of the bridge. Elements of metal I-Beams will be assembled together to form the structure of the deck and a crane will constitute the beam elements by placing and welding on site. The connectors on the beams allow the steel structure to be bonded to concrete slab of the latter. After the beams are installed and connected on the designated supports, reinforcement and formwork are set up before pouring concrete to form a slab of a certain thickness.

In the final stage of the implementation, after several months, asphalt or a very specialized type of bitumen, whose characteristics allow to withstand deck expansions, will be laid on the road. Hence, even with some deformations of the structure, the bitumen will not crack and remains of quality to accommodate the road traffic. In the end, connections with approach roads, safety features, and traffic control programs will be put in place to meet the requirements.

4.4 Manpower requirements During Construction

During construction phase, the project will employ the labor especially from local peoples at the highest level of workforce for two years to complete the Bridge Project. Local workers shall be used to the maximum extent possible, even though external skilled workers will not be deniable for the capacity requirements. The contractor shall provide workers protective gears (PPE), e.g. masks, helmets, gloves, and safety shoes at no cost and the contractor shall also provide adequate information about importance of protective equipment and application training. All staff and workers shall attend training to aware of occupational health and safety risks and to comprehend potential cause serious injuries for workers in construction work.

4.5 Construction machineries

Following equipment will be employed approximately in the construction of the bridge.

Table 5: Approximate Equipment to be employed in the bridge construction

Equipment to be employed	Approximate number of units
Batching plant	1
Excavator	2
Roller	2
Loader	3
Water bowser	1
Crane	1
Grader	1
Tipper or Truck	12

Raw materials such as cement and reinforced bars will be imported from China and other construction composite materials such as sand and gravel will be obtained locally.

The project anticipates seeing waste generation containing scrap metal parts, packaging materials, concrete debris from various construction works, spoils from earth works, municipal wastes from the project crews including workers, and scrap paper wastes from office related works. Wastewater generation from the project crews could be projected in the implementation works.

4.6 Alternatives

The Project Management Unit (PMU) has considered several aspects in alternatives. Among the options, the currently selected plan stood out as the best options in conformity to the project's technical, financial, environmental, and social requirements.

Firstly, alternatives for the location was taken into consideration in the decision-making process. The option to place near the existing bridge appeared to be attractive but at the same time, environmental concerns from compounded sedimentary deposition together with the existing bridge, social issues involving land acquisitions from already crowded tight land area, and ongoing worry with traffic congestion would be counterintuitive to sway the weight of decision.

The location near the river bend posed as a shorter route opportunity. On the other hand, this location also brought up the identical environmental issue from sedimentary deposition with the slow flow at the river bend. Therefore, the current location posed as the best fit for all requirements including environmental and social aspects.

In the bridge design, consideration for effects in the river water flow and for increase in sediment deposition were thought out and proper foundation design that would least impact the flow rate and sediment deposit were selected. For that, the number of supports and their designs were carefully selected to minimize the level of impacts. In selection of materials, the decision was made to favor local products without compromising the integrity of the bridge's required strength.

5.0 DESCRIPTION OF THE SURROUNDING ENVIRONMENT

The whole project area in Kunlong lies on the narrow stretch of Thanlwin River valley between two mountain ranges in the North and the South. Hilly terrain dominates the whole area. Thanlwin River flows from west to east in this particular area. While remnant of natural forest could be observed on hill tips with difficult access, the majority of the tree coverage in the area consists of secondary forests and ever-expanding rubber plantations. Southern side of the river could be seen with more forest coverage while the populated areas in the northern part see only scarce forests. The whole project area is surrounded by rubber plantations.

Chinshwehaw, a border town near China's Yunan Province is located in the northeast of Kunglon. Theinni, the junction city to go to Muse and Chinshwehaw is located in the west and Lashio town is located in the southwest of Kunlong. Kunlong town thrives with cross-border trade, other economic activities, and cash crops.

5.1 Setting the Study Limits

In order to identify the environmental, social, cultural, and visual impacts of the bridge construction, area of influence along 4.26 Km project area that includes the approach road is analyzed with regards to the project related activities, survey findings, and information from stakeholder consultations. While building of the bridge is primarily the main theme of the project, ancillary facilities such as approach road are also included in the studies of environmental and social assessments.

While the environmental related impacts are limited to an area of 500 meters wide for the bridge construction and access road, the direct and indirect anticipated social, cultural and visual impacts will be set within 1.5 Km radius due to land acquisition and access road construction. All environmental studies including air quality, water, soil, and biodiversity surveys covered the stretch of the planned approach road. Social studies also involved the communities and peoples from the area of the approach road. The maps for environmental and social surveys will show the area coverage inclusive of the area to cover the approach road. (See Figure. 8, 9 and 10) Therefore, regarding with the nature of the construction process and project design, the project's area of influence (AOI) is determined to be within 1.5 km radius of the project which would be sufficient to cover in general for the project of this type while the area of influence(AOI) for the approach road is determined to be within 500 m radius of the approach road.

The environmental and social information of the EIA study include air, noise, water and soil quality assessment, biodiversity and socio-economic information were also collected from both primary and reliable secondary sources. The existing topography, rainfall, temperature, ecological resources, and land use were recorded from the secondary sources.

5.2 Methodology and Objectives

The environmental study for the proposed project baseline information and its surrounding environment is comprised of physio-chemical, biological, socio-economic and cultural components. The major objectives of the baseline data gathering are to understand the relationship and interaction between the different components and to document the existing

environmental conditions of the proposed project area so as to analyze, compare, and monitor the changing condition along the project life cycle and to estimate the potential environmental impacts.

The primary surveys data gathering including on site measurements and socio-economic conditions were conducted in monsoon seasons for physio-chemical and biological components. The climate, topography, some geomorphological conditions, protected area, hazardous condition and township level demographic information of the project area were gathered from various sources especially https://www.worldweatheronline.com and http://themimu.info/township-profiles. The existing soil chemical composition, surface and ground water quality, ambient air and noise levels monitoring, and nature of habitat for ecological flora and fauna were identified as the primary baseline conditions of the project. The socio-economic and cultural condition of the project affected communities were gathered with structured interview questionnaire during the key information surveys from randomly selected households. The data gathering methodologies for each component are described detail in the subsequent sections of this chapter.

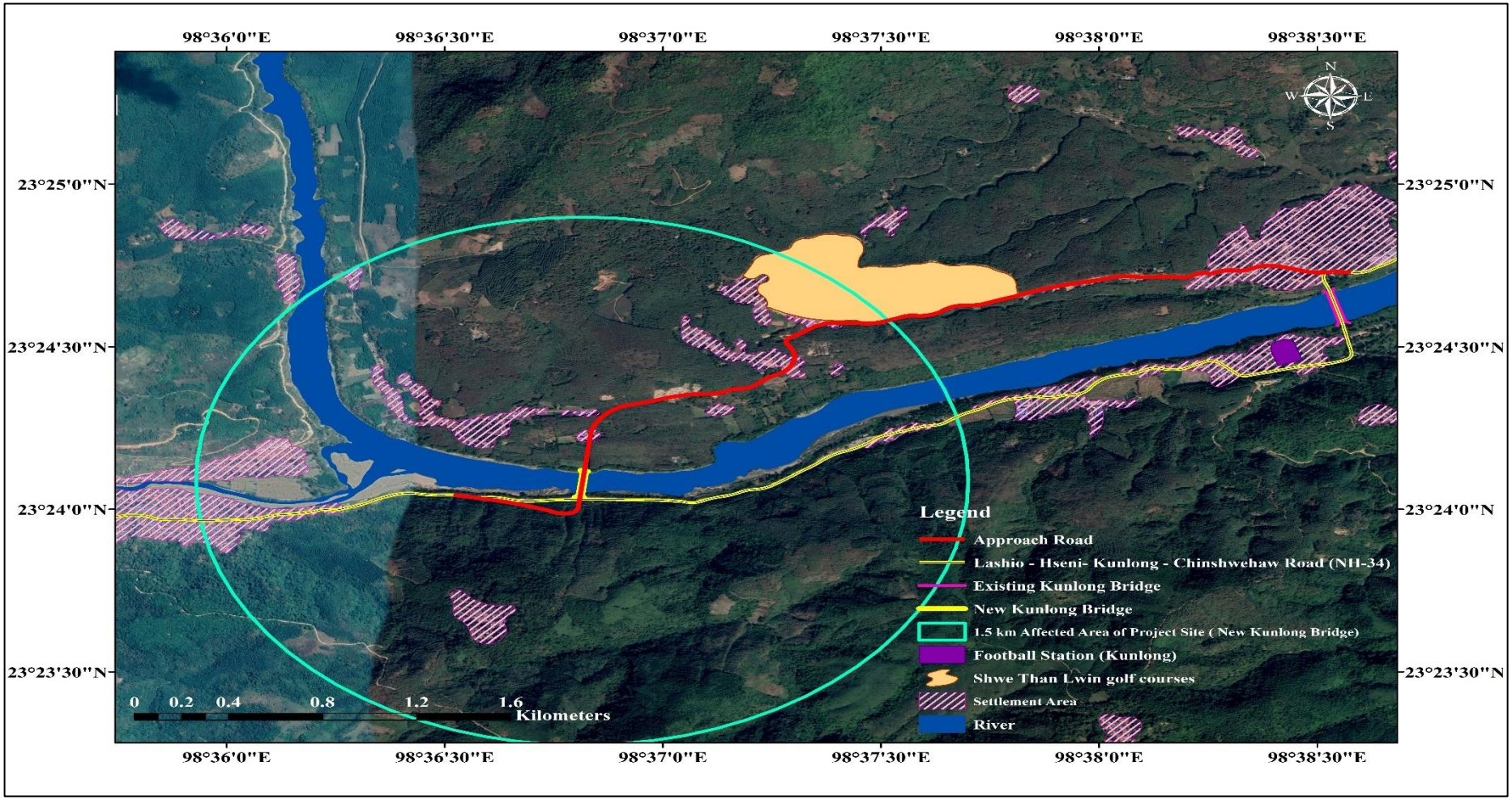


Figure 8: Affected Area (1.5 km) of Project Site (for New Kunlon Bridge)

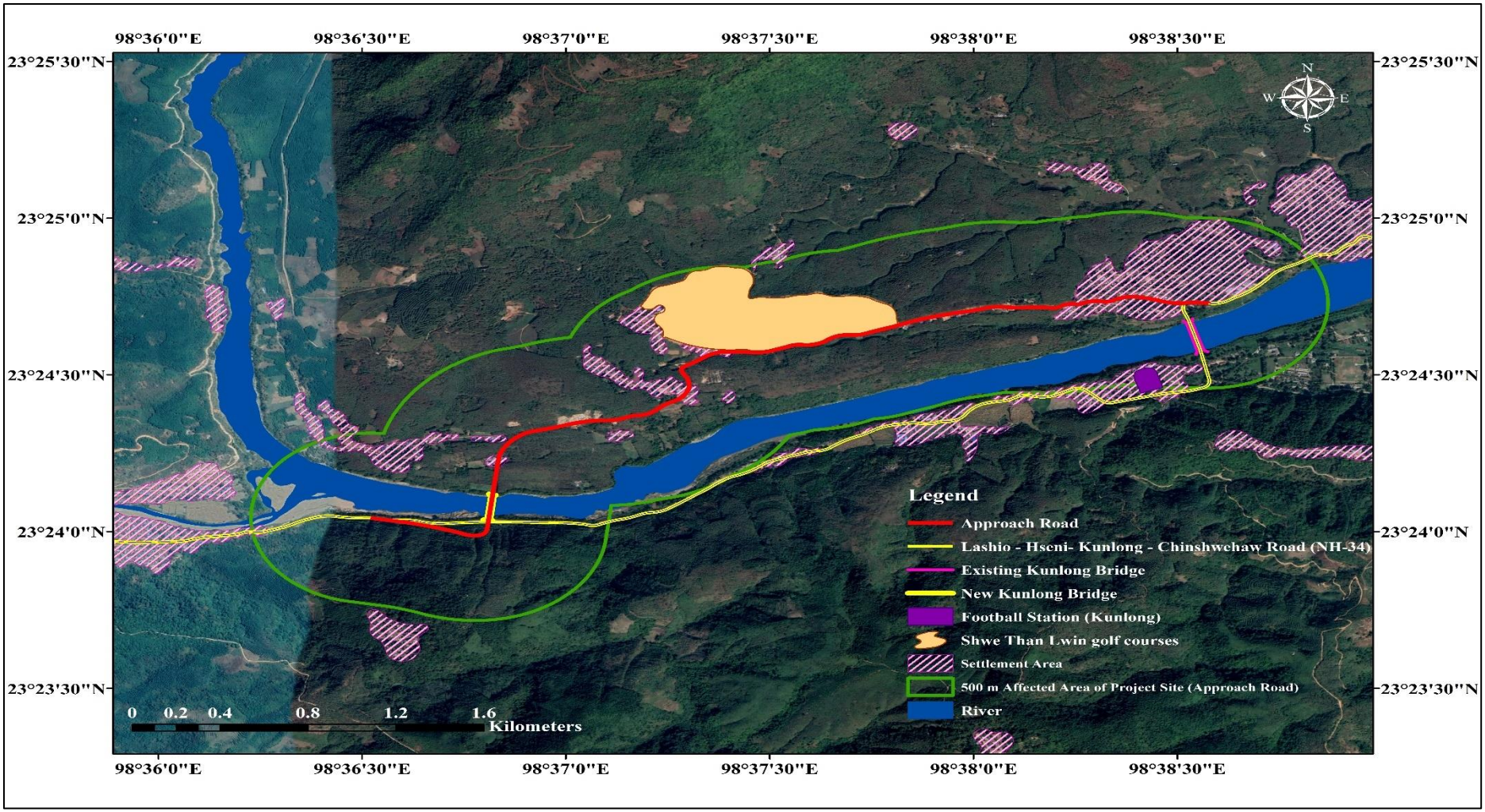


Figure 9:Affected Area (500m) of Project Site for the approach road

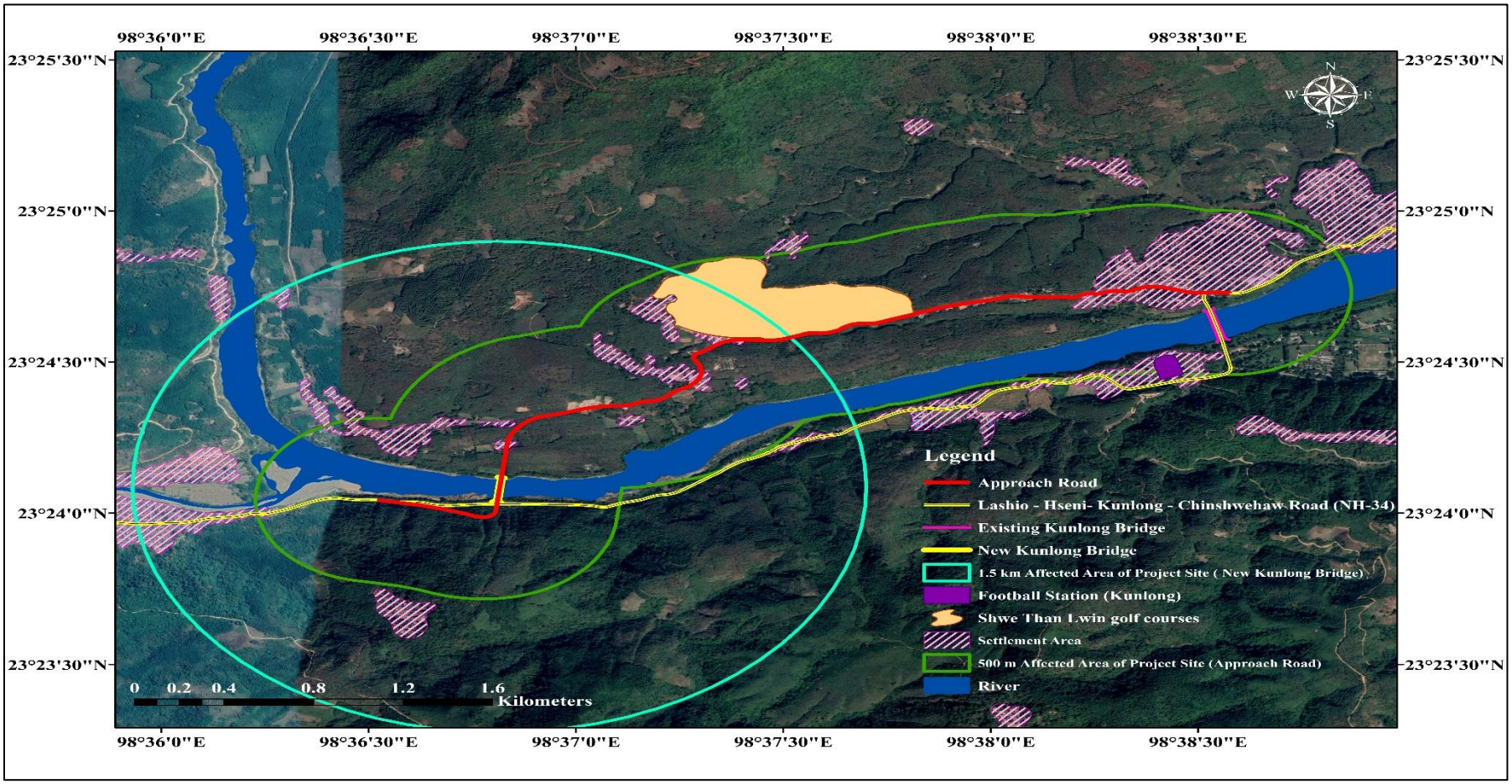


Figure 10: Affected area of project site (for both Approach road and New Kunlon Bridge)

5.3 Physical Components

5.3.1 Climate condition

Tropical wet and dry climate is the classic climate of the region. The climate is generally wet year-round with slight minor variations. The mean annual temperature of Kunlong Township ranges between 15-degree C and 31-degree C, whilst the coldest period of the year tends to be between December and February, and the warmest period of the year is between March and May.

The average annual temperature is 28.25 °C and the average annual rainfall is 6.03 mm. The driest month, March receives 0.01 mm of rainfall. The highest amount of precipitation occurs in August, with an average of 22.24 mm. The warmest month of the year is April with an average temperature of 31 °C. The lowest average temperatures in the year occur in February with around 5°C. The difference in precipitation between the driest month and the wettest month is 22.24 mm. The variation in temperatures throughout the year is 18 °C. The monthly average weather condition of the township in 2019 was shown in the following table.

Table 6: Monthly Average Weather Condition of Kunlong Township (2019)

Categories	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	17	26	20	15	11	8	8	7	10	10	12	10
Min. Temperature (°C)	8	5	11	16	19	21	21	22	20	20	16	6
25Max. Temperature (°C)	25	31	31	31	30	29	29	29	30	30	28	16
Precipitation / Rainfall (mm)	-	-	0.01	6.18	2.96	11.98	14.95	22.24	5.71	4.62	3.74	0.36
Days (Rainfall)	-	-	2	12	9	21	21	27	14	8	4	3

http://themimu.info/township-profiles?field_doc_tx_state_regions_tid=62

5.3.2 Topographic condition

The area exists in a mountainous region with a few terrains leading to noticeable gradient toward the west. Elevation of the terrain on the mountain so called “Main Ma Hla” rises from east to west. Moreover, Kunlong township is above sea level of 1413 feet and the highest mountain in township is “Tar Shwe Htan” mountain that is above 7171 feet. River and streams are relatively low within the area however, the prominent river and creeks are so called “Than Lwin” River, “Nant Tain” Creek and “Nant” Creek. “ThanLwin” River is about 29.5

miles long that is flowing from north to south and it drains a narrow and rocky watershed along the river. Nant Tain" Creek is about 14.2 miles long that flows from east to west while "Nan Linn" creek is about 34.5 miles long that flows from west to east. The project site is surrounding by the mountainous areas and it covers mostly forest areas, agricultural surroundings, public and private plantations especially rubber.

5.3.3 Environmental Conservation area

There is no protected area in the surrounding areas of the project area. In terms of environmental conservation, total forest areas (8026 acres) are conserved including reserved forest area and non-reserved forest area. Moreover, public owned forest area (42 acres) and mixed crops cultivation with forest area (30 acres) are done by the government together with the private sector in the fiscal year of 2017-2018.Moreover, the government did the plantation for Teak, Pyin Ka Toe, Yae Tin Win, and Maezalae together with the local people totaling to 25000 plants. There is found wildlife such as deer, ibex or serow, reindeer, wolf and many kinds of monkey in the Kunlong township area.

5.4 Air Quality, Noise and Vibration monitoring survey

In the absence of background air quality data, air quality monitoring was conducted twice separately, once in wet season (September 2019) and another in dry season (December 2019). To obtain representative air quality of the whole area, four sampling sites were selected, near the project site, near around Ton Kyat Village, and upwind and downwind sites of project's locations. In compliance to MONREC's directives, two air quality surveys in different seasons were conducted for the project. Under the supervision of an experienced air quality specialist, the site-specific air quality measurements were conducted using standard ambient air quality monitoring instruments.

The sampling time for each pollutant were set at: 24 hours for PM_{10}, $PM_{2.5,}$ 24 hours for NO_2, 24 hours for SO_2, 24 hours for Ozone and 24 hours for VOC.

The measurement data were then processed to obtain relevant averaging data of each air pollutant in comparison with the respective values from NEQEG and WHO guidelines. Noise measurements were also carried out in the vicinity of air quality sampling stations. Existing noise levels were recorded. The following instruments in **Table 7** were employed for the ambient air quality and noise level surveys.

Table 7: Air Quality Monitoring Equipment

Study	Parameter	Equipment	Survey frequency
Air Quality	-PM 10, PM 2.5, So2, NO2, CO, VOC, Ozone	- GRI-IAT Air Monitoring Station - Nephelometer/ HPC600 (A)	- 4 stations - 24 hours monitoring per station
Air Quality	-SO2, NO2, CO	- 4 in 1 Gas detector	- 4 stations - 24 hours monitoring per station
Noise level	- 24-hour noise level - Degree of exposure	- Empirical data / -CEM(DT-8852) Sound level meter	- 4 stations - 24 consecutive hours collection

World Bank Group Air Quality Guidelines and Noise Level Guidelines

The World Bank Group has developed a range of environmental, health and safety (EHS) guidelines. Part of these guidelines include specific standards for ambient air quality and noise. The World Bank Group adopts the ambient air quality guidelines from the World Health Organization (WHO). The following table provide the standards. According to the World Bank Group EHS Guidelines, noise impacts should not exceed the levels presented in the following tables.

Table 8: WHO Air Quality Guidelines

Parameter	Averaging Period	Guideline Value (ug/m3)
Particulate Matter PM10	1 year	20
	24 hours	50
Particulate Matter PM2.5	1 year	10
	24 hours	50
Sulfur Dioxide (SO2)	24 hours	20
	10 minutes	500
Nitrogen Dioxide (NO2)	1 year	40
	1 hour	200

Source: WHO Air Quality Guidelines

Table 9: World Bank Group Noise Level Guidelines

Receptor	Daytime (07:00-22:00)	Night-time (22:00-07:00)
Residential, institution, educational	55	45
Industrial, commercial	70	70

Source: National Environmental Quality (Emission) Guidelines (NEQEG)

Air Quality Standard

MONREC maintains that every project is required to preserve pre-existing air quality of a site. In accordance with the stipulated Environmental Impact Assessment Procedure (December 2015), National Environmental Quality (Emission) Guidelines (NEQEG) was adopted in late December 2015. The project is committed to comply with general requirements stated in the NEQEG.

Table 10: General National Environmental Quality (Emission) Guidelines

Parameter	Averaging period	Guideline value in µg/m3
Sulfur dioxide (SO2)	24-hour	20
	10 minutes	500
Nitrogen dioxide (NO2)	1-year	40
	1-hour	200
Particulate Matter PM10	1-year	20
	24-hour	50
Particulate Matter PM2.5	1-year	10
	24-hour	25
Ozone	8-hourly daily maximum	100

Source: National Environmental Quality (Emission) Guidelines, 2015.

Noise Quality Standard

Noise quality assessment has to meet the guidelines' value to be in compliance with MONREC's NEQEG requirements. The project is to follow general requirements as stated in the NEQEG. General guidelines' value for noise levels are shown in Table 10.

Table 11: National (Myanmar) Environmental Quality (Emission) Guidelines Noise Level

Receptor	One Hour, LAeq (dBA)	
	Daytime 07:00-22:00	Night-time 22:00 – 07:00
Residential/ Institutional/ Educational	55	45
Industrial/ Commercial	70	70

Source: National Environmental Quality (Emission) Guidelines, 2015

Monitoring Locations

The ambient air quality assessments were conducted in the following four locations covering the whole project area. The first location was at the south part of project site (KLA1), the second place was located at north part of the project site (KLA2) and the third place was located at near the quarry mine (KLA3). The fourth site was the near the Ton Kyat village (KLA4). The assessment sites and the geographic coordinate points are presented in the following table and location map of the project.

Table 12: **Geographic coordinate locations of Air monitoring points**

Sampling point	GPS Coordinates
KLA 1	23°24'02.02"N 98°36'46.43"E
KLA 2	23°24'12.96"N 98°36'49.05"E
KLA 3	23°24'20.66"N 98°37'01.70"E
KLA 4	23°24'41.37"N 98°37'56.63"E

Source: Based on the survey in September, 2019 and December 2019

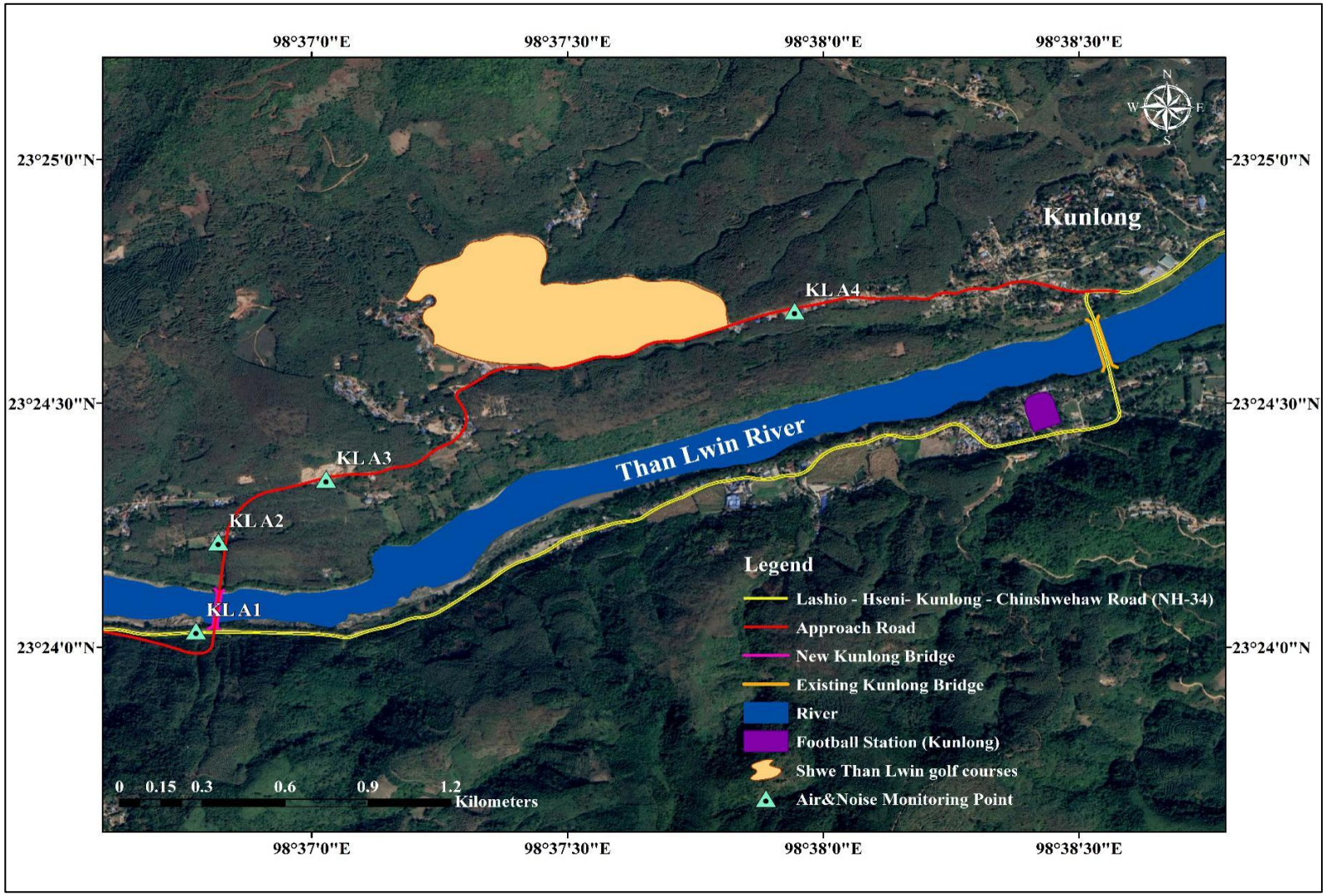


Figure 11: Air and Noise Monitoring Locations Map

Survey Activities

The ambient air monitoring was conducted twice specifically once in September 2019 during the wet season and once in December 2019, the dry season. The following table described the air quality sampling plan.

Table 13: **Air Quality Monitoring Plan**

Sampling Site & Parameter	Wet Season				Dry Season			
	KLA1	KLA2	KLA3	KLA4	KLA1	KLA2	KLA3	KLA4
PM_{10}	27 to28 September 2019	26 to 27 September 2019	26 to 27 September 2019	27 to28 September 2019	9 to 10 December 2019	8 to 9 December 2019	8 to 9 December 2019	9 to 10 December 2019
$PM_{2.5}$	27 to28 September 2019	26 to 27 September 2019	26 to 27 September 2019	27 to28 September 2019	9 to 10 December 2019	8 to 9 December 2019	8 to 9 December 2019	9 to 10 December 2019
NO_2	27 to28 September 2019	26 to 27 September 2019	26 to 27 September 2019	27 to28 September 2019	9 to 10 December 2019	8 to 9 December 2019	8 to 9 December 2019	9 to 10 December 2019
SO_2	27 to28 September 2019	26 to 27 September 2019	26 to 27 September 2019	27 to28 September 2019	9 to 10 December 2019	8 to 9 December 2019	8 to 9 December 2019	9 to 10 December 2019
VOC	27 to28 September 2019	26 to 27 September 2019	26 to 27 September 2019	27 to28 September 2019	9 to 10 December 2019	8 to 9 December 2019	8 to 9 December 2019	9 to 10 December 2019
Ozone	27 to28 September 2019	26 to 27 September 2019	26 to 27 September 2019	27 to28 September 2019	9 to 10 December 2019	8 to 9 December 2019	8 to 9 December 2019	9 to 10 December 2019

Source: Based on baseline survey in 2019

Meteorological Data

The meteorological data for the sampling periods including air temperature, relative humidity, sea level atmospheric pressure, wind speed and rainfall were obtained from the World Weather Online website https://www.worldweatheronline.com**.** A summary of the meteorological conditions is reported in the table below.

Table 14: **Weather Conditions during the Air Quality Sampling Periods**

2019	Temperature (average) (ºC)	Relative Humidity (%)	Sea Level Pressure (mb)	Wind Speed (km/h)	Rainfall (mm)
Wet Season					
September 26	24	90	1015	7	6.30
September 27	25	88	1015	4.5	19.60
September 28	24	84	1014	4	5.80
September 29	25	83	1014	4	6.50
Dry Season					
December 8	22	66.75	1016	3.5	0
December 9	22.5	72	1016	3.5	0
December 10	22	73.37	1013	3.25	0

Source: https://www.worldweatheronline.com

Air Quality Analysis Results

The results of the air quality examination were tabulated in the following table.

Table 15: **Air Quality Monitoring Results**

Site	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	SO_2 (µg/m^3)	NO_2 (µg/m^3)	CO (ppm)	VOC (ppm)	Ozone (µg/m^3)
	24-hour Average	24-hour Average	24-hour Average	1 hour Maximum	24-hour Average		(8-hour)
Wet Season							
KLA 1	32	13	12.27	17.64	0.224	0.14	13.11
KLA 2	12	8	3.145	7.146	0.124	0.14	13.09
KLA 3	51	35	7.861	5.644	0.475	0.092	13.10
KLA 4	26	17	8.624	7.248	0.494	0.15	13.12
Dry Season							
KLA 1	34	21	11.14	15.24	0.211	0.13	13.01
KLA 2	17	13	6.438	10.84	0.115	0.14	13.23
KLA 3	53	23	8.624	6.328	0.400	0.16	13.21
KLA 4	45	22	10.21	10.43	0.451	0.14	13.15
WHO Standard							
Interim1	150	75	125	-			
Interim2	100	50	50	-			
Interim3	75	37.5	-	-			
Guideline	50	25	20	200	9	-	100
NEQEG Standard							
Standard	50	25	20	200	-	-	100

Source: Based on survey data during September and December 2019

Particulates Matters (PM_{10} and $PM_{2.5}$) - The monitoring results in Table 15 show that concentrations for PM_{10} and $PM_{2.5}$ daily average values were lower than the 24 hours WHO guidelines and NEQEG Standard in both seasons except KLA 3. At KLA 3, located near the quarry mine, the daily average concentration of PM_{10} and $PM_{2.5}$ were higher than the 24 hours WHO guidelines and NEQEG Standard in both seasons. The potential sources of the exceedance would be emission of particles from quarry operation and dust emission from unpaved road.

Sulphur Dioxide (SO_2) - For SO_2 concentrations were lower than the 24 hours WHO guidelines and NEQEG Standard (20 µg/m3) for all air quality baseline monitoring stations in both seasons.

Nitrogen Dioxide (NO_2) - For NO_2, the hourly maximum concentration was found to be lower than the WHO hourly standard (200 µg/m3) for all monitoring locations in both seasons.

Carbon monoxide (CO) - The monitoring results show that concentrations for CO are low the WHO AAQG 24-hour mean target levels at all monitoring stations in both seasons.

Noise Quality Baseline survey

Noise level examinations were coincided with air quality monitoring studies. Noise level assessments were carried out at the vicinity of air quality examinations. Existing noise levels were recorded. A CEM (DT-8852) sound level meter was employed for 24 consecutive hours each at the monitoring locations. The locations were randomly selected to be representative noise monitoring in and around the project site. The degree of effects from the noise level and duration of noise exposure were analyzed using the empirical data obtained from the monitoring. At each location, the result from daytime and night-time were calculated by averaging hourly sound pressure levels measured between 07:00 and 22:00 hours (daytime) and between 22:00 to 07:00 hours (nighttime), respectively.

Noise levels were recorded using an industrial noise level meter at about 1.5m above ground with no reflecting surface nearby in accordance with IFC guidelines.

Monitoring Sites

The noise monitoring campaign was conducted to obtain representative noise monitoring around the project area. The monitoring points were located near the locations of the air monitoring sites and their geographic coordinates are shown in following table.

Table 16: **Noise Monitoring locations**

Sampling point	GPS Coordinates
KLN 1	23°24'1.98"N 98°36'46.51"E
KLN 2	23°24'12.96"N 98°36'49.01"E
KLN 3	23°24'20.66"N 98°37'1.73"E
KLN 4	23°24'41.34"N 98°37'56.55"E

Source: Based on survey data during September and December 2019

Monitoring Plan

24 hours continuous measurements were carried out at all monitoring sites. Table 17 shows the monitoring plan for noise assessment.

Table 17: **Noise Monitoring Plan**

Sampling Site & Duration	Wet Season				Dry Season			
	KLN 1	KLN 2	KLN 3	KLN 4	KLA 1	KLA 2	KLA 3	KLA 4
Day Time (7am-10pm)	27 September 2019	26 September 2019	26 September 2019	27 September 2019	9 December 2019	8 December 2019	8 December 2019	9 December 2019
Night Time (10pm-7am)	27 to 28 September 2019	26 to 27 September 2019	26 to 27 September 2019	27 to28 September 2019	9 to 10 December 2019	8 to 9 December 2019	8 to 9 December 2019	9 to 10 December 2019

Source: Based on survey data for wet season and dry season

Results of Baseline Noise Monitoring

24-hours continuous monitoring of noise levels were investigated in comparison with the NEQEG Standard. The background noise levels are typical of a general rural environment with some traffic activities. The results of noise level of day and night time for three monitoring points in two seasons were under the NEQEG standard and WHO guidelines but the monitoring point, KLA 1 has been observed that the noise level of day time in two seasons was just over the limited standards. However, the contribution of noise level from the populace at the South part of the project site (KLA 1) is negligible as thinly populated residential areas have been observed.

Table 18: **Results of Baseline Noise Level**

Duration and Location	Day Time (7am – 10pm)	Night Time (10pm – 7am)
Wet season		
KLA 1	**56.66**	42.21
KLA 2	46.45	39.43
KLA 3	46.29	40.46
KLA 4	46.19	41.24
Dry season		
KLA 1	**55.42**	44.73
KLA 2	45.63	42.33
KLA 3	41.82	40.63
KLA 4	42.38	43.92
NEQEG Standard (Residential/ Institutional/ Educational)	**55**	**45**
WHO Guidelines	**55**	**45**

Source: Based on survey data for wet season and dry season

Figure 12: Air and Noise Monitoring Location (KLA1)

Figure 13: Air and Noise Monitoring Location (KLA2)

Figure 14:Air and Noise Monitoring Location (KLA3)

Figure 15:Air and Noise Monitoring Location (KLA4)

Vibration Monitoring

To obtain representative vibration levels of the specified sites, as required, 15 minutes continuous vibration level monitoring for 4 defined sties were carried out in project site. Corresponding GPS coordinate points together with photo records, date, and time of each sampling period of each site were documented. While vibration is not required by ECD, the survey will include vibration measurements to obtain background vibration levels of the locations. Vibration Meter (SDL 800) and Data Logger was employed to study vibration at the study sites. 15 minutes measurement was carried out each site.

Table 19: **Vibration Monitoring Method**

Study	Parameter	Method / Equipment	Survey frequency
Vibration level	- 15 minutes continuous vibration level	- (VM-6370) Vibration level meter	4 sites (15 minutes continuous monitoring per site)

Table 20: **Result of Vibration**

Sampling point	Coordinate points	Vibration levels VEL mm/s
For Wet Season		
V 1	23°24'02.06"N 98°36'46.90"E	0.1
V2	23°24'07.17"N 98°36'49.01"E	1.3
V3	23°24'20.69"N 98°37'1.78"E	0.1
V4	23°24'41.28"N 98°37'56.58"E	0.1
For Dry Season		
V 1	23°24'02.06"N 98°36'46.90"E	1.3
V2	23°24'07.17"N 98°36'49.01"E	2.4
V3	23°24'20.69"N 98°37'1.78"E	1.4
V4	23°24'41.28"N 98°37'56.58"E	1.2

Source: Based on survey data during September and December 2019

5.5 Water Quality Monitoring

The Survey team for water resources and quality identified existing water resources in the area and examined properties of water and water quality of the river in the project site. Water sources were geo-referenced and onsite water quality tests were performed for samples from upstream, downstream, and the new bridge locations of the river. The survey studied upstream point from the bridge installation site, the site for the bridge construction, and downstream from the site selected for the bridge establishment in Thanlwin River near Kunglon. Only one major river, namely Thanlwin River passes the area and the new bridge is going to be built to cross from one side to the another.

Field measurements using portable and reliable equipment including YSI multiple parameters professional meter were carried out for all homogenized samples. Measurements for field water quality analysis consisted of pH, EC, Salinity, Turbidity, water temperature, ORP, DO, and TDS together with the information for ambient air temperature and weather conditions at the time of sampling. In addition, visual survey of potential water pollution sources was included in the study. All laboratory analysis parameters except for total coliform were examined at Ecological Laboratory. Total coliform was analyzed at ISO Laboratory. Water quality examinations in different seasons have been planned to establish baseline water quality data for the project area. Sampling at two different seasons will be conducted to observe the trend of changes in quality of the water bodies. Water quality monitoring for the first survey was carried out in October 2019.

Water Sampling Method

The water quality survey team strictly followed the guidelines from the APHA Standard Methods (2015 - 21st edition) in sample collection, handling, storage, and shipping. Samples were collected in pre-cleaned amber bottles. Before each sample was collected, the bottles were rinsed three times with respective samples. GPS identification of the location, sample collection time were recorded at each step for quality control.

For the survey, composite sampling application was applied in sample collection and different samples from various places of a site were put in a pre-cleaned jar to be thoroughly mixed for having the state of homogeneity. To determine the representative state of water quality from the river, only composite and homogenized water samples were collected at the sampling locations.

Water Sample Collection and Analysis

Total of four water samples including a duplicate sample were collected and examined due to the extent of the small area coverage. Bacteria analysis was performed at ISO Tech Laboratory and the rest of the laboratory analysis were carried out at Ecological laboratory. The laboratory analysis results of collected water samples are presented in the following tables and the original lab results are also attached in the annexes. Array of parameters specified in National Environmental Quality (Emissions) Guideline (NEQEG) were analyzed in a laboratory. These parameters will set the state of baseline water quality for the project. These parameters are presented in comparison to NEQEG's Guideline's values.

The water quality baseline survey was simultaneously initiated on 1st October 2019 for first time survey and 11th December, 2019 for second time survey. The sampling sites and their related GPS references are shown in the following *Table 21*. And the water sample location map was shown in Figure 16.

Table 21. Monitoring Plan for Water quality survey at both seasons

Sample point	Coordinate-N	Coordinate-E	Date of sampling	Time of sampling
Wet Season				
KLB-1	23° 24' 06.99"	98° 36' 32.21"	1/10/2019	9:09 AM
KLB-2	23° 24.5' 05.41"	98° 36' 46.54"	1/10/2019	10:05 AM
KLB-3	23° 24' 10.00"	98° 37'14.77"	1/10/2019	10:35 AM
Dry Season				
KLB-1	23° 24' 06.99"	98° 36' 32.21"	11/12/2019	9:08 AM
KLB-2	23° 24.5' 05.41"	98° 36' 46.54"	11/12/2019	9:25 AM
KLB-3	23° 24' 10.00"	98° 37'14.77"	11/12/2019	10:00 AM

Source: Based on baseline survey during October and December 2019

Results of water quality analysis

Analytical results for surface water samples were compared with NEQEG Guidelines values. Based on the laboratory analysis, all parameters at three points along the Thanlwin river for the first season were under the limited standard except total suspended solid. Additionally, the survey team collected the water sample from tube well in Tadar Oo village and the laboratory result was shown that only total coliform bacteria was over the limited standards. The results of the field water quality analysis and the laboratory analysis for the first season are presented in the following tables from Table 22 to Table 25.

The river at one side of the bank at KLB1 with the depth of 1.27 m was flowing at 0.667 m/s. The depth at the middle point of KLB1 was over 20 m and the flow were too rapid to capture the velocity. The river's current in monsoon season, at the time of the first survey, was so strong. Due to the political instability at the time of the survey, resources availability was limited, and numerous restrictions were in place for activities in the river. During the second survey, Thanlwin River's morphology was studied. That includes river's depths, and flows at different level in each cross-section of the river.

Table 22. Onsite Measurement Result for the first season water quality survey

Field analysis parameter	Unit	Result		
		KLB -1	KLB-2	KLB-3
Water Temperature	˚C	22.8	21	21.2
Air Temperature	˚C	29	34.1	
Barometer	mmHg	720.5	720.1	719.5
Dissolved Oxygen	mg/l	23.96	16.91	8.24
Conductivity	µS/cm	526	426	496.6
Total Dissolved Solid	mg/l	357.50	349.70	347.75
Salinity	Ppt	0.26	0.26	0.26
pH	Scale	8.13	7.8	8.78
ORP	mV	232.2	216	197.8
Turbidity	NTU	114	153	166

Table 23. Water Quality Laboratory Result for the first season water quality survey

Laboratory analysis parameter	Unit	Result			NEQEG Guidelines
		KLB-1	KLB-2	KLB-3	
pH	Scale	8.2	7.9	8	6-9
Total Suspended Solid	mg/l	**79**	**91**	**90**	50
Biological Oxygen Demand	mg/l	4.6	4.3	4.2	30
Chemical Oxygen Demand	mg/l	<30	<30	<30	125
Cyanide (free)	mg/l	<0.01	<0.01	<0.01	
Phosphorus	mg/l	<0.3	<0.3	<0.3	2
Lead	mg/l	0.1	0.1	Not Detected	
Total Nitrogen	mg/l	<5	<5	<5	10
Oil and Grease	mg/l	4	3	5	10
Total Coliform Bacteria	100ml	30	44	40	400

Source: Based on baseline survey during October 2019

Table 24. Water Quality Laboratory Result for KLB- first season (Duplicate Point)

Laboratory analysis parameter	Unit	Result	NEQEG Guidelines
pH	Scale	8.1	6-9
Total Suspended Solid	mg/l	**76**	50
Biological Oxygen Demand	mg/l	4	30
Chemical Oxygen Demand	mg/l	<30	125
Cyanide (free)	mg/l	<0.01	
Phosphorus	mg/l	1.5	2
Lead	mg/l	Not Detected	
Total Nitrogen	mg/l	<5	10
Oil and Grease	mg/l	5	10
Total Coliform Bacteria	100ml	30	400

Source: Based on baseline survey during October 2019

Table 25. Water Quality Laboratory Result at KBW(Tadar Oo village) for the first season

Laboratory analysis parameter	Unit	Result	Drinking Standard
pH	Scale	7.6	6.5-8.5
Temperature	°C	23	-
Color	Pt-Co	16	-
Turbidity	FAU	<5	≤10 FAU
TSS	mg/l	3	-
TDS	mg/l	71	-
Conductivity	mS/cm	0.1	≤2.5 mS/cm
Nitrate-Nitrogen	mg/l	1.5	≤10 mg/L
Nitrite	mg/l	≤ 0.03	≤3 mg/L
Phosphate	mg/l	24	-
Arsenic	mg/l	0	≤ 0.01 mg/L
Iron	mg/l	<0.1	≤ 0.2 mg/L
Lead	mg/l	0.1	≤ 0.01 mg/L
Zinc	mg/l	0.03	-
Total Coliform count	100ml	**760**	400

Source: Based on baseline survey during October 2019

In the second season survey, the survey team measured the depth of the river and the flow velocity of the river. According to the measurable result, the depth of the river at KLB-1 was observed at 1.5 m, 12 m, and 9.9 m respectively at the opposite of the road, at the middle of the river, and the bank near the road. The flow velocity varied from 0.19 m/s, 0.86 m/s, and 0.09 m/s respectively. The depth of the river at KLB-2 was observed at 3.81 m, 12.89 m, and 2.62 m respectively at the opposite of the road, at the middle of the river, and the bank near the road. The flow velocity varied from no measurable flow, 1.22 m/s, and 0.72 m/s respectively. The depth of the river at KLB-3 was observed at 5.6 m, 6.58 m, and 1.35 m respectively at the opposite of the road, at the middle of the river, and the bank near the road. The flow velocity varied from no measurable flow, 0.3 m/s, and no measurable flow respectively. The onsite measurement result and laboratory result during the second season were shown in the following table.

Table 26. **Onsite Measurement Result for the second season survey**

Field analysis parameter	Unit	Result		
		KLB -1	KLB-2	KLB-3
Water Temperature	˚C	13.1	13.2	13.2
Air Temperature	˚C	19	19	19
Barometer	mmHg	725.4	725.2	725.1
Dissolved Oxygen	mg/l	13.78	12.05	12.03
Conductivity	µS/cm	462.8	479.0	464.8
Total Dissolved Solid	mg/l	389.35	403.40	390.00
Salinity	Ppt	0.29	0.30	0.29
pH	Scale	5.67	6.35	6.61
ORP	mV	339.6	327.8	328.6
Turbidity	NTU	23.94	29.13	28.38

Source: Based on baseline survey during December 2019

In general, the river's water quality profile for the bridge seems to be Okay throughout the area. However, the high level of Phosphorus could be noted in both upper section and lower section of the river. Regardless of that particular parameter, the other parameters all seem to be in good range. The detail information of water result for the second season were shown in the following tables.

Table 27. Water Quality Laboratory Result for the second season survey

Laboratory analysis parameter	Unit	Result			NEQEG Guidelines
		KLB- 1	KLB-2	KLB-3	
pH	Scale	7.1	7.2	7	6-9
Total Suspended Solid	mg/l	0	0	0	50
Biological Oxygen Demand	mg/l	3.5	4	3.1	30
Chemical Oxygen Demand	mg/l	<30	<30	<30	125
Cyanide (free)	mg/l	0.01	<0.01	<0.01	
Phosphorus	mg/l	**5.8**	0.4	**4.2**	2
Lead	mg/l	Not Detected	Not Detected	Not Detected	
Total Nitrogen	mg/l	1.3	<5	<5	10
Oil and Grease	mg/l	3	6	3	10
Total Coliform Bacteria	100ml	24	24	18	400

Source: Based on baseline survey during December 2019

Table 28. Water Quality Laboratory Result at KLB (Duplicate one) for the second season

Laboratory analysis parameter	Unit	Result	NEQEG Guidelines
pH	Scale	7.3	6-9
Total Suspended Solid	mg/l	0	50
Biological Oxygen Demand	mg/l	3.3	30
Chemical Oxygen Demand	mg/l	<30	125
Cyanide (free)	mg/l	0.01	
Phosphorus	mg/l	**6.4**	2
Lead	mg/l	Not Detected	
Total Nitrogen	mg/l	1.8	10
Oil and Grease	mg/l	3	10
Total Coliform Bacteria	100ml	20	400

Source: Based on baseline survey during December 2019

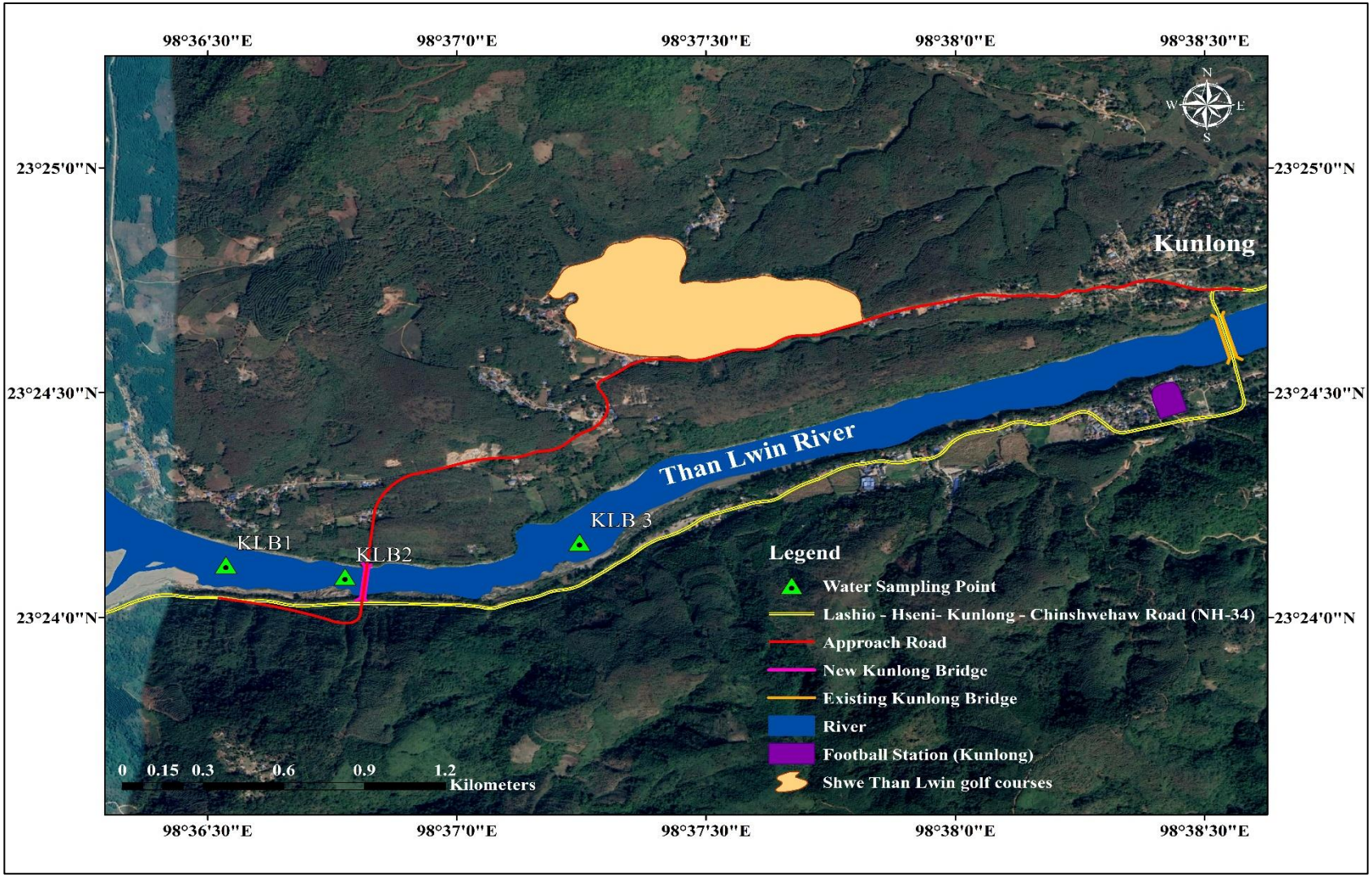


Figure 16: Water Sample Locations Map

5.6 Geology and Soil

5.6.1 Summary of Geological Condition

The geological condition of the ground surface in the project area is divided into two categories: Plateau Limestone Group and Chaung Magyi Group. (see Figure 17) Generally, Kunlong township which the project area falls into, is covered by Plateau Limestone Unit. Chaung Magyi Group comprises the bedrock along the mountain ranges namely Mong Long Mica Schists, Pawn Chaung Series and their equivalents. It is found that the project site is very close to the Moe Meik Fault.

5.6.1.1 Plateau Limestone Group

The topsoil layer is clayey soil layer and it is reddish in color. The thickness of these clayey soil layers is 0.5 m to 1.0 m. It has low to medium plasticity in moist condition. The limestone fragments are also mixed with clayey soil are widely observed in the study area.

5.6.1.2 Chaung Magyi Group

The composition is a light gray, fine to medium-sized sandy loam soil type. That is characterized by loosely cemented parent rock with trace sand.

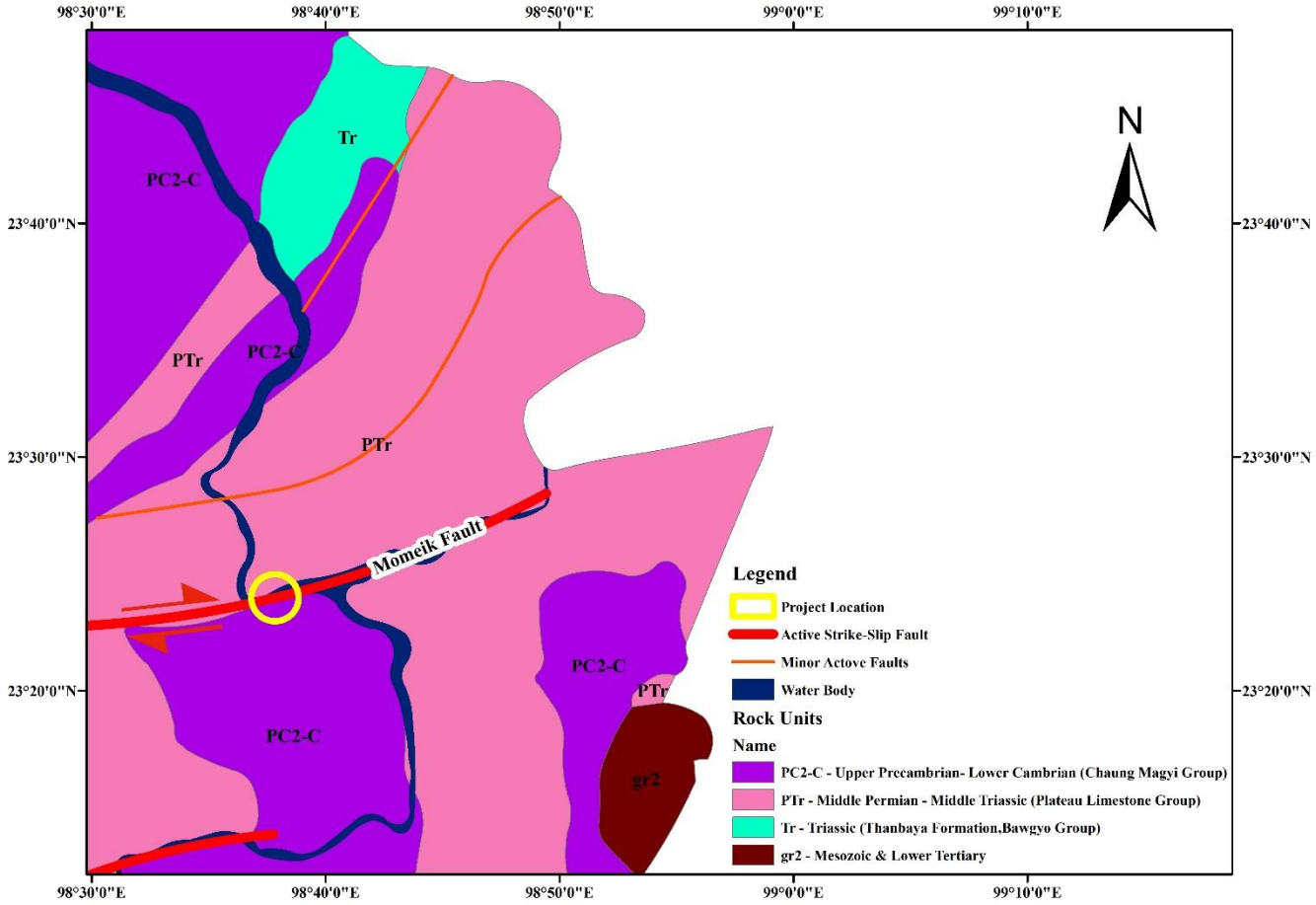


Figure 17: Geological Map of Kunglon Area

5.6.2 Soil Quality Survey

Survey of soil condition and content of pollutants around the Bridge construction site in Kunlong township was conducted in wet season during September and dry season during December. Geotechnical randomized sampling was used in soil condition monitoring. The soil quality survey can identify the levels of soil composition for the project affected area around the Kunlong bridge. In order to identify the different soil types and land use, the soil samples were collected from four locations near the project site to obtain the representative data and information. The selected samples from the affected areas were collected from a surface of 16 cm to 1 m. About 1-meter thick samples from a hole were collected from all horizons inside the pit. For physical and chemical analysis, at least 2 kg weight for a soil sample was acquired. In addition, the current patterns of land use: river water usage and ground water usage has been identified in the surrounding area based on field survey during the soil survey period. The visual soil survey was done to study some physical parameters for onsite and laboratory analysis, and the chemical analysis was done at Department of Research and Innovation Analysis Laboratory under the Ministry of Education.

Selection of sampling Locations

The soil sampling locations were identified primarily based on the local distribution of vegetation, agricultural practices, and the sighting of change in soil patterns. The sampling locations were mainly selected from the agricultural field and project site. The sampling locations are outlined in Table 29 and presented in Figure 11.

Table 29. Soil Sampling Location in the Study Area

Sample Name	Location (Coordinates)
Soil KLS 1	23°24'2.16"N, 98°36'46.39"E
Soil KLS 2	23°24'7.17"N, 98°36'48.99"E
Soil KLS 3	23°24'20.65"N, 98°37'2.27"E
Soil KLS 4	23°24'40.30"N, 98°37'55.23"E

Source: Based on survey during September 2019

Methodology and Equipment

The soil samples were collected during the monitoring period. Soil sampling exercise makes sure that the samples collected from the all locations are homogeneous representative of each location. At random 10 sub locations were identified at each location and soil was taken from 1 meter below the surface. To collect the soil sample, AMS Basic Soil Sampling Kit (a standard soil sampler) are used in soil condition investigation. Collected soils from a site is uniformly mixed before homogenizing the soil samples. The samples were filled in polythene bags, labeled in the field with number and site name and sent to the Department of Research and Innovation Laboratory under the Ministry of Education laboratory for analysis.

Selection of Soil Survey Parameter

Soil is generally separated into two horizons of minerals and organic constituents of variable depth, which differ from the parent material below in morphology, physical properties, constituents, chemical properties, and composition and biological characteristics. The physio-chemical characteristics of soil have been determined at four locations during the monitoring period with respect to Cadmium, Chromium, Copper, Lead, Nickel, Zinc, Arsenic, Nitrogen, Phosphorous, Potassium, pH etc. The sampling locations have been selected to represent the study area and Figure 18 shows the Soil Sampling Location Map.

Soil Results

The detailed soil results of all the monitoring locations during 1st season(wet) and 2nd season(dry) are as shown in the following tables. Based on the findings from laboratory analysis of soil samples, no sample displayed above the alarming serious trace of heavy metal concentration with regards to the USEPA Standards.

Table 30. 1st Season Laboratory Soil Analysis Results

Sr. No	Test Parameters	Method/ Equipment	Unit	Soil KLS 1	Soil KLS 2	Soil KLS 3	Soil KLS 4	USEPA
1.	Cadmium as Cd	Arthur I Vogel, F.A.A.S, Nitrogen Analyzer	mg/kg	5.60	1.97	4.51	1.97	70
2.	Chromium as Cr		mg/kg	36.38	87.94	46.11	120.41	230
3.	Copper as Cu		mg/kg	18.19	19.87	20.41	30.59	-
4.	Lead as Pb		mg/kg	46.65	42.18	43.15	35.75	4003
5.	Nickel as Ni		mg/kg	62.76	44.07	56.12	60.40	1600
6.	Zinc as Zn		mg/kg	44.17	75.74	49.25	62.77	23000
7.	Arsenic as As		mg/kg	0.06	0.03	0.08	0.08	0.4
8.	Nitrogen as N		%	ND	ND	ND	ND	-
9.	Phosphorous as P		%	ND	ND	ND	ND	-
10.	Potassium as K		%	1.56	3.35	1.13	2.94	-
11.	pH Value	(10% Solution)		7.21	7.01	7.50	7.30	-

Source: Based on survey data during September 2019

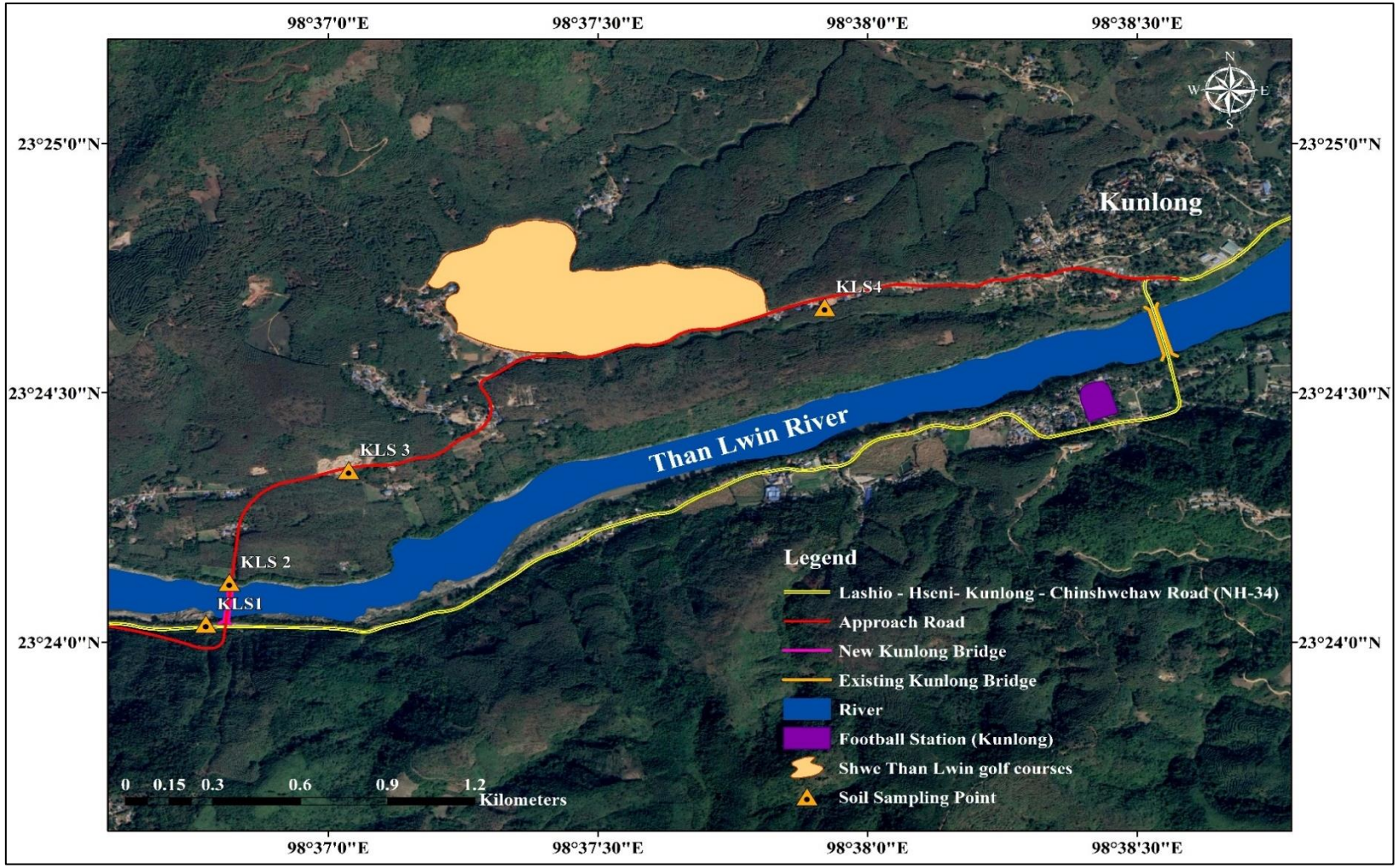


Figure 18. Soil Sampling Location Map

Table 31. 2nd Season Laboratory Soil Analysis Results

	Test Parameters	Method/ Equipment	Unit	Soil KLS 1	Soil KLS 2	Soil KLS 3	Soil KLS 4	USEPA
1.	Cadmium as Cd	Arthur I Vogel, F.A.A.S, Nitrogen Analyzer	mg/kg	4.76	2.59	3.37	2.96	70
2.	Chromium as Cr		mg/kg	96.94	151.69	115.89	97.19	230
3.	Copper as Cu		mg/kg	18.64	26.75	25.00	20.74	-
4.	Lead as Pb		mg/kg	38.07	23.95	36.52	27.66	4003
5.	Nickel as Ni		mg/kg	51.15	33.13	39.87	45.63	1600
6.	Zinc as Zn		mg/kg	52.14	72.65	57.95	48.23	23000
7.	Arsenic as As		mg/kg	<0.005	<0.005	0.01	<0.005	0.4
8.	Nitrogen as N		%	N.D	N.D	N.D	N.D	-
9.	Phosphorous as P		%	N.D	N.D	N.D	N.D	-
10.	Potassium as K		%	1.14	1.75	1.14	1.08	-
11.	pH Value	(10% Solution)		7.10	7.21	7.12	7.30	-

Source: Based on survey during December 2019

Analysis Method

Soil samples were sent to the Department of Research and Innovation Laboratory, Under the Ministry of Education (SCIENCE and TECHNOLOGY) for analysis. The analysis method for all concerned heavy metal parameters is Atomic Absorption Spectrophotometer.

5.7 Natural Hazards

Myanmar regularly experiences cyclones, storm surges, floods, landslides, earthquakes, drought and forest fires. Over the last 10 years, Myanmar has been impacted by two major earthquakes, three severe cyclones, floods and other smaller-scale hazards. According to the Government's Department of Disaster Management (DDM), the project site hasn't been experiencing flesh floods in the recent years.

Myanmar is one of the earthquake prone countries since it is in the Alpide Earthquake Belt and has already experienced many destructive earthquakes and for examples are 1839 Innwa earthquake, 1930 Bago earthquake, 1956 Sagaing earthquake, 1912 Maymyo earthquake. All these events are of the magnitude ≥ 7.0 (Mw). The deadliest earthquake happened in Myanmar was the 1930 Bago earthquake struck on May 30 and the magnitude was 7.3 Mw. It caused 500 deaths in Bago and 50 in Yangon, and many buildings were damaged. Phyu earthquake on December 3, 1930 was originated in the southern segment of Sagaing Fault. Therefore, the cities located along this fault are highly prone to the future occurrences of large-scale quakes. According to the Myanmar Seismic Zone Map (2005) in , the project area falls in the severe zone for earthquake.

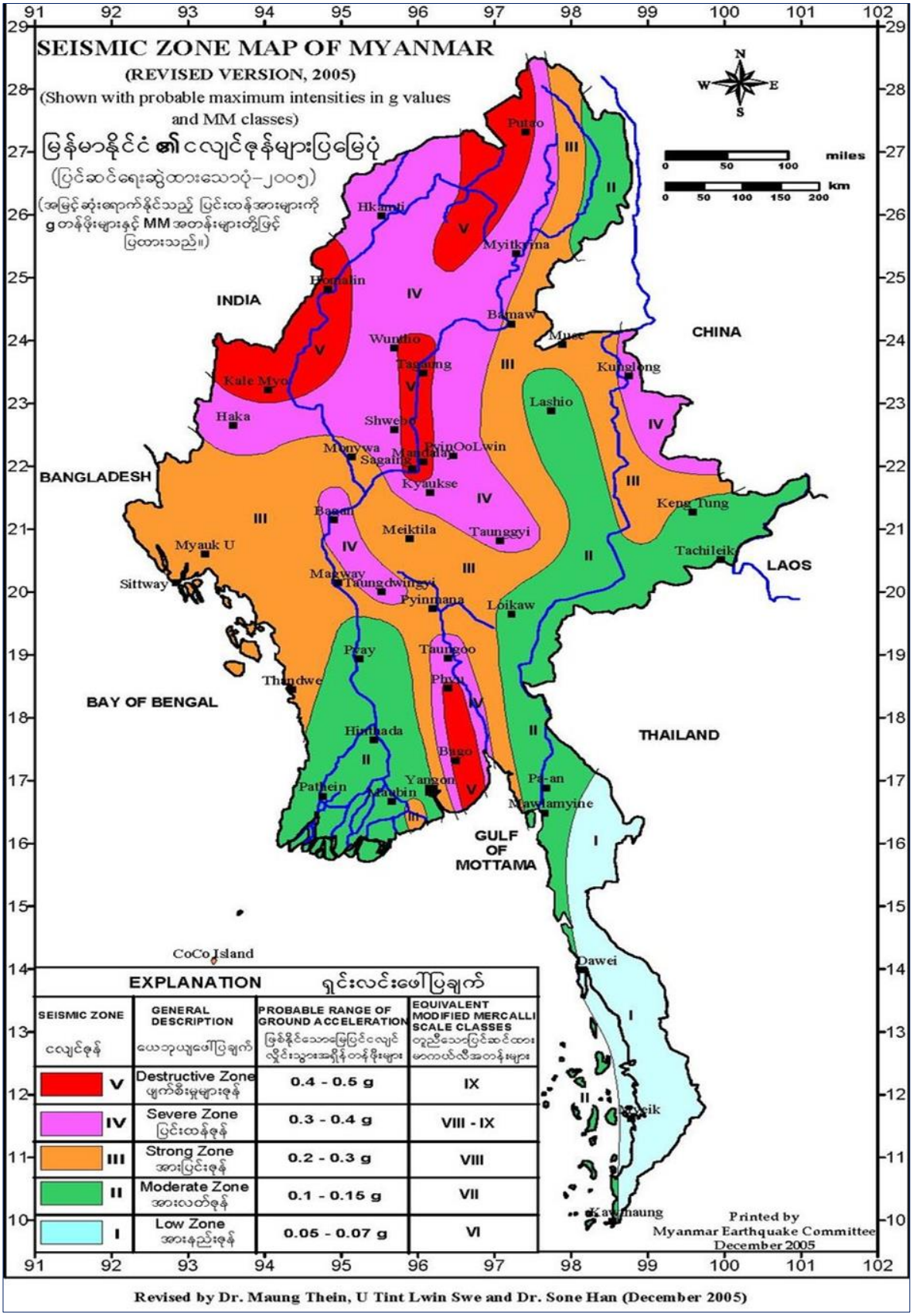


Figure 19: Myanmar Seismic Zone Map

5.8 Biological components

The new Kunglon bridge project is located between Holy village and Tong Kyat Village in Kunglon township, Lashio district of Shan state. In order to establish the background data of flora and fauna for the proposed project's rehabilitation and improvement, the field survey was conducted in the month of September and December 2019 that could be considered as the survey for wet season and dry season. The proposed project area is surrounded by rubber plantation, corn plantation, bamboo, Maezali, Thitel, and Loukya. The general habitat of the proposed project area and its surrounding environment are under Tropical Wet Evergreen Forest condition with above 77% in annual rainfall in accordance with major vegetation type of Myanmar (Sources Kress et al, 2003 of NBSAP 2015-20) which was shown in Figure 20.

After many years of reckless and intensive exploitation by lumberjacks and hunters, and substitution of rubber plants for short term economic gain without taking into account of losses in the natural ecosystem, the population of trees and animals is gradually decreasing to a serious level in the environmental landscape of the area. Some particular trees such as Taung Sakyin, Netmyar, Say Ohn Pout, Fern, and Zee phyu are generally founded around the project area. Most of the dominant tree species observed in the project area are Thitel, Loukya, bamboo and rubber while the small shrubs species such as Phatya, Phone Mathain, Sein Nar Pan and Zee Pin are also observed in the project area. Moreover, in accordance with findings from survey activities and the oral recollection from the long-term residences in the project area, many kinds of plants and trees such as Thitya, Maezali, Zeephyu, Tamalan, Maisaw, Pitauk, Yaymana, gonshaw, Thitel, Malaka, Sis Pin, wild cherry and various types of bamboo were also observed in the surrounding areas of project sites.

Similarly, based on the collection of the information from the hunter, frequent sighting of various animal species including tiger, rhinoceros, elephant, moose (Sat), boar (Taw wet), Jhe, Myouk lwe kyaw, Taung sate, Wet won, Thamin, Thin gway gyat, Daung, Aunk chin, Joe, Ngat taw, Aung loung ngat, Khawe tu wet tu and Shint was common in the past but at present such animal are scarcely founded in the area due to be intense hunting and lack of serious efforts to make conservation, which could drive these animals to the brink of extinction. Some types of venomous snakes such as Mway zeinn, Mway hauk and Sapargyi are still present in that area. Additionally, based on the collection of information from the fishermen along the project area, various species of fish namely Nga pyay ma, Nga Mounn Ma, Nga Yant, Nga Kyinn, Nga khu, Nga phyinn Tha Let, Nga kyee, Nga Myit Chinn, Nga Zin Yainn, Nga Gonn Ma, Nga Myuin, Nga Bat, Nga Mway Htoe and Nga Shint Ne are founded in Than Lwin river. Credible documents of the existing species could hardly be located to help identify the threatened species. It is still a long way away from compiling records of all species' patterns and behaviors to determine adverse impacts on them by development projects.

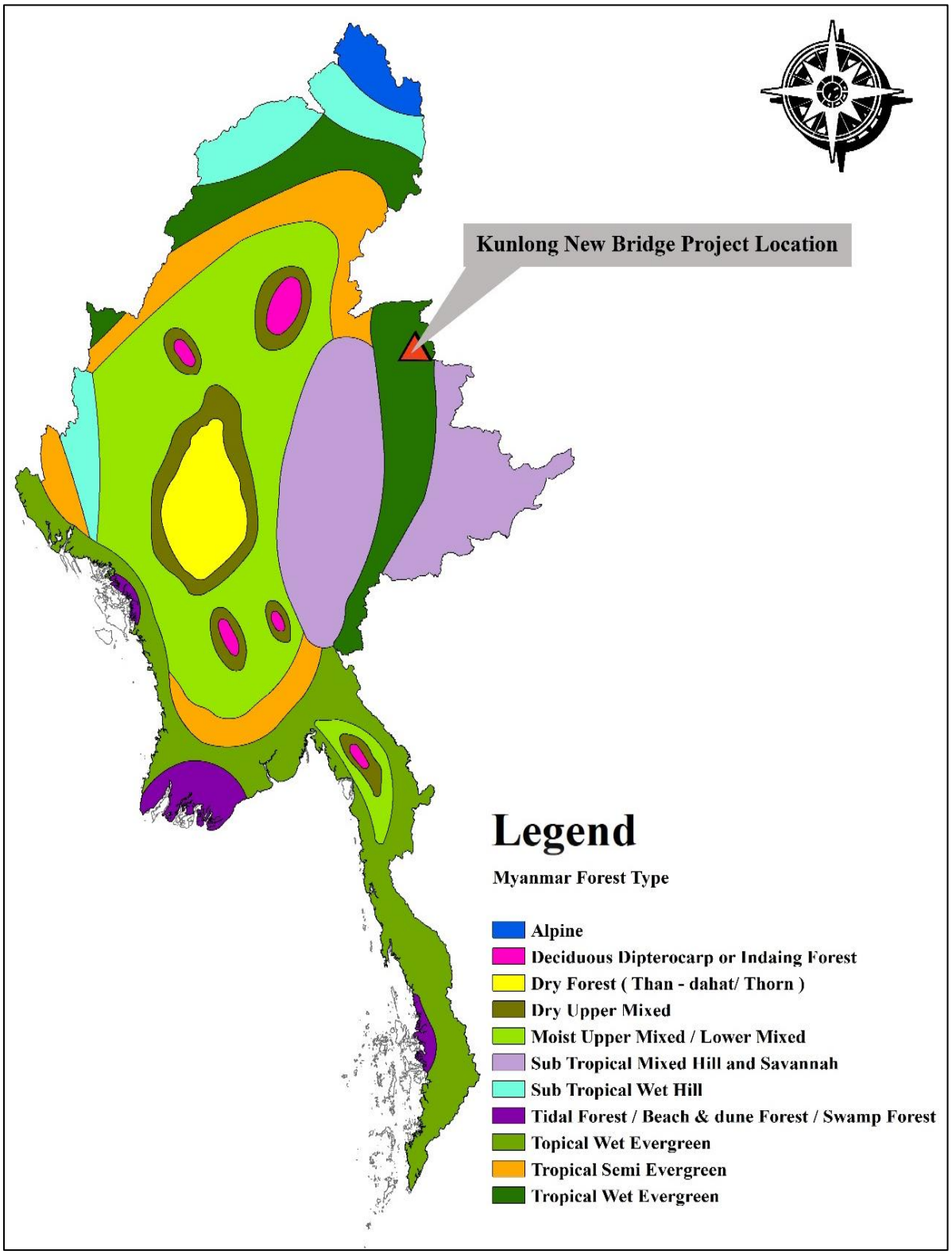


Figure 20: Major vegetation type of Myanmar; (Sources Kress et al, 2003 of NBSAP 2015-20)

5.8.1 Methodology for Ecological flora and fauna monitoring

The ecological conditions of the project surrounding area are identified by the quadrant method. The six samples plotted the buffer area of 1.5 km from the proposed project. There are KB1, KB2, KB3, KB4, KB5 and KB6. The sample plot with the total area of 10× 10m each were delineated, and all flora and fauna species observed in each plot were identified for their habitat nature and species diversity's assessment. The biological survey data gathering was conducted at two different seasons in 2019, specifically during September for wet season and during December for dry season. All flora and fauna species from the sample plots observed in each season were identified and listed. In order to get more detail information of existing ecological habitat, the commonly observed trees and animal species were also documented. The coordinate points of the ecological data sampling points are described in Table 32. Rubber plantation and golf area lie along the approach road.

Table 32. The coordinate locations of six sample plots in wet season and dry season

No	Date		Bio point	GPS point
	1st Season	2nd Season		
1	26/9/2019	9/12/2019	KB1	N 23°23'52.96" E 98°37'1.59"
2	26/9/2019	8/12/2019	KB2	N 23° 23' 38.90" E 98° 36' 02.95"
3	27/9/2019	8/12/2019	KB3	N 23° 24' 9.12" E 98°35'42.74"
4	28/9/2019	9/12/2019	KB4	N 23° 24' 37.02" E 98° 37' 43.47"
5	28/9/2019	10/12/2019	KB5	N 23°24'17.55" E 98°37'1.04"
6	28/9/2019	10/12/2019	KB6	N 23°24' 12.69" E 098°36'25.73"

K- Kunlong, B-Biodiversity

Source: Based on baseline survey during September and December 2019

KB1 point is covered by shrubs and small trees such as East Indian glory bower and Chinese sumac. Among the observed shrubs and small trees, most trees (90%) are small followed by 10 % in shrubs while the large size of Needle wood tree is 6.3cm in KB1 point. KB2 point is mostly covered by Sweet Chestnut (Thitel) and the size of Sweet chestnut is ranging between o.24m- 4.45m in this point. KB3 is generally covered by various kinds of bamboo, abundance of Elephant rope tree, Kassod tree and White siris. KB4 is the pastureland which hosts various species of grass in this area. Rubber plants dominate KB5 point. KB6 point is located near the ThanLwin river and herbs, shrubs, trees and bamboo have been investigated in this area. *Figure 21* shows the biodiversity sampling points for New Kunglon Bridge project.

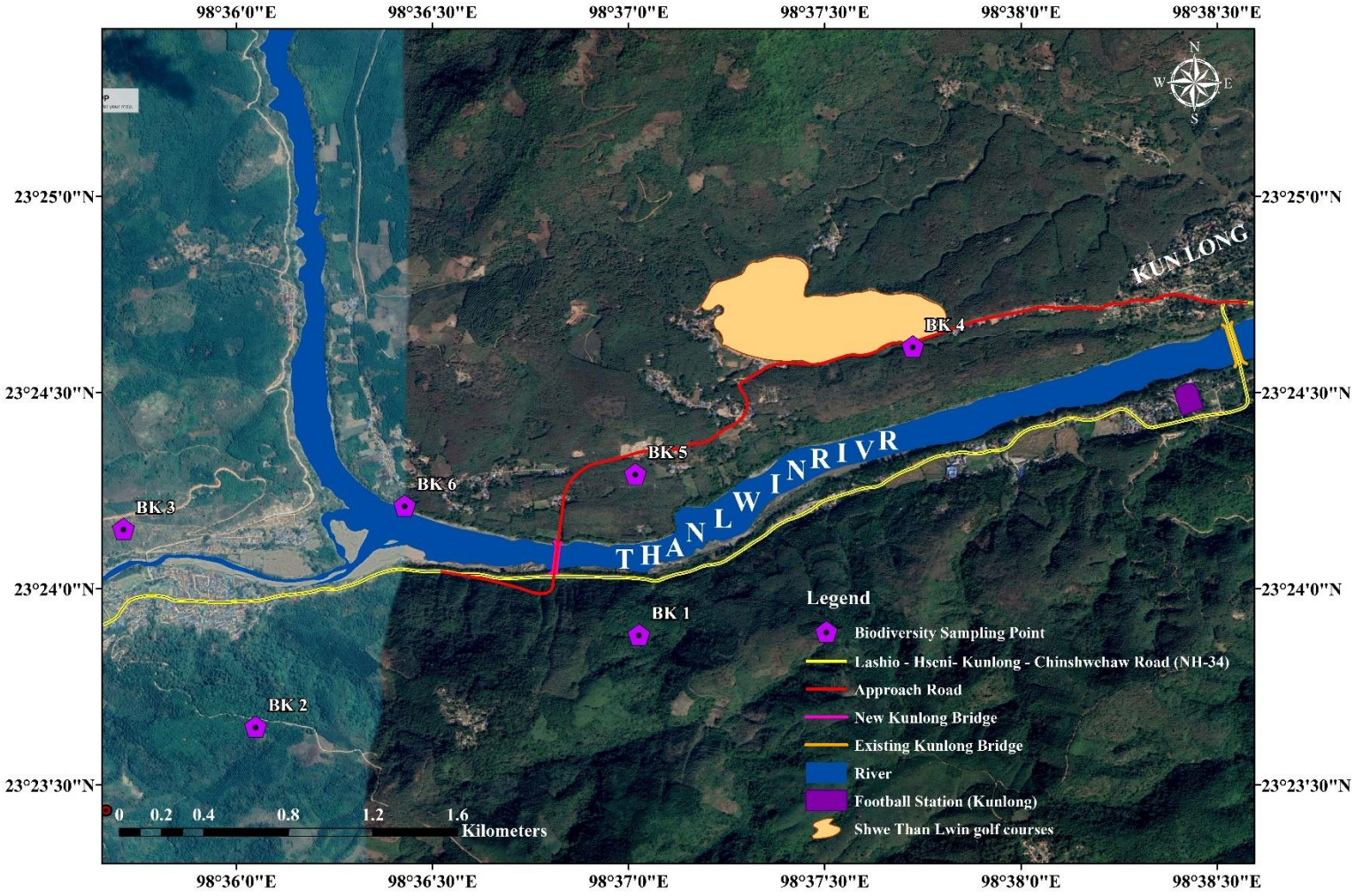


Figure 21: Biodiversity Sampling points for New Kunglon Bridge project

5.8.2 Two seasons monitoring results

The natural vegetation and biological condition of the KungLon Bridge project surrounding area were identified for existing ecological baseline condition. As the project zone is already under Tropical Wet Evergreen Forest area, tree like taung mae oak (*Alstonia scholaris)* and myauk ngo (*Duabanga grandiflora*), bushes like sein nar pan (*Lantana camara)* and say ohn pout (*Melastoma affine)* and climber like doe pin (*Entada rheedii*) are commonly observed. The biological survey data gathering was conducted in both wet and dry season. The number of flora species observed in each 10 square meter plots are identified and counted in both seasons. During the wet season, total number of flora species observed in each sampling points is ranging between 12-24 species while majority have at least 20 species. The flora species of each sampling points for dry season are not too different with those of wet season as the sampling area under the undisturbed condition. The identified species found in the study areas were classified into groups: tree, small tree, shrub, herb, climber, bamboo and grass and then, were checked according to the International Union for Conservation of Nature (IUCN) Red list Category. The observed kinds of flora and fauna species during the wet season and dry season are described in the following tables.

Monitoring results of flora species during the wet season survey

Table 33. List of flora species observed in six sampling points during wet season

Sr. No	Common name	Scientific name	Family name	Habits	IUCN
10 sq.m plot in KBL1					
1	Chinese sumac	*Rhus chinensis*	Anacardiaceae	ST	LC
2	Malabar goose berry	*Melastoma clarkenum*	Melastomaceae	S	-
3	Yoruban bologi	*Crassocephalum rubens*	Asteraceae	H	-
4	Common bracken	*Pteridium aquilinumtiaceae*	Dennstaedtiaceae	F	-
5	East Indian glory bower	*Clerodendrum colebrookianum*	Lamiaceae	S	-
6	Smilaxes	*Smilax perfoliata*	Smilacaceae	CL	-
7	Velvet bean	*Mucuna pruriens*	Fabaceae		-
8	Black nightshade	*Solanum nigrum*	Solanaceae	S	-
9	Basket grass	*Lomandra sp*	Asparagaceae	G	-

10	Dwarf white bauhinia	*Bauhinia acuminata*	Fabaceae	S	LC
11	Blackboard tree	*Alstonia scholaris*	Apocynaceae	T	LC
12	Benghal dayflower	*Commelina benghalensis*	Commelinaceae	H	LC
13	Jujube	*Ziziphus jujuba*	Rhamnaceae	ST	LC
14	Citron	*Citruas medic*	Rutaceae	ST	-
15	Red lucky seed	*Adenanthera pavonina*	Fabaceae	T	LC
16	Indian gooseberry	*Phyllanthus emblica*	Phyllanhaceae	ST	-
17	Air yam	*Dioscorea bulbifera*	Dioscoreaceae	CL	-
18	Snuff box sea bean	*Entada rheedii*	Fabaceae	CL	-
19	Needlewood tree	*Schima wallichii*	Theaceae	T	LC
20	Caesarweed	*Urena lobata*	Malvaceae	S	-
21	Hairy fig	*Fucus hispida*	Moraceae	ST	-
22	Dwarf white orchid	*Duabanga grandiflora*	Lythraceae	T	LC
10 sq.m plot in KBL2					
1	Common lantana	*Lantana camara*	Verbenaceae	S	-
2	Singkrang	*Saurauia roxburghii*	Actinidiaceae	ST	LC
3	Drooping fig	*Ficus semicordata*	Moraceae	T	LC
4	Tiger grass	*Thysanolaena latifolia*	Poaceae	G	-
5	Kenda	*Macaranga peltata*	Euphorbiaceae	S	-
6	Asian ticktrefoil	*Desmodium heterocarpon*	Fabaceae	H	-
7	Sweet chestnut	*Castanea sativa*	Fagaceae	T	LC
8	Shikakai	*Acacia concinna*	Fabaceae	CL	-
9	East Indian glory bower	*Clerodendrum colebrookianum*	Lamiaceae	S	-

10	Tea	*Camellia sinensis*	Theaceae	S	DD
11	Bodhi tree	*Ficus religiosa*	Moraceae	T	-
12	Black-jack	*Bidens pilosa*	Asteraceae	S	-
13	Sambong	*Blumea balsamifera*	Asteraceae	S	LC
14	Giant fern	*Angiopteris evecta*	Marattiaceae	F	-
15	Crepe ginger	*Cheilocostus speciosus*	Costaceae	H	-
16	Smilaxes	*Smilax perfoliata*	Smilacaceae	CL	-
17	Hamilton's bamboo	*Dendrocalamus hamiltonii*	Poaceae	B	-
18	Velvet leaf bamboo	*Dendrocalamus brandisii*	Poaceae	B	-
19	Needlewood tree	*Schima wallichii*	Theaceae	T	LC
20	Velvet bean	*Mucuna pruriens*	Fabaceae	CL	-
10 sq.m plot in KBL3					
1	Midnight horror	*Oroxylum indicum*	Bignoniaceae	ST	-
2	Elephant rope tree	*Sterculia villosa*	Malvaceae	T	-
3	Shikakai	*Acacia concinna*	Fabaceae	CL	-
4	Common lantana	*Lantana camara*	Verbenaceae	S	LC
5	White siris	*Albizia procera*	Fabaceae	T	LC
6	Dwarf white bauhinia	*Bauhinia acuminata*	Fabaceae	S	LC
7	Velvet leaf bamboo	*Dendrocalamus brandisii*	Poaceae	B	-
8	Indian gooseberry	*Phyllanthus emblica*	Phyllanthaceae	ST	-
9	Salpani	*Desmodium gangeticum*	Fabaceae	S	-
10	Kenda	*Macaranga peltata*	Euphorbiaceae	S	-

11	Kassod tree	*Senna siamea*	Fabaceae	T	LC
12	Fragrant rosewood	*Dalbergia odorifera*	Fabaceae	T	LC
13	White siris	*Albizia procera*	Fabaceae	T	LC
14	Longsheath bamboo	Thyrostachys siamensis	Poaceae	G	-
15	Siam weed	*Chromolaena odorata*	Asteraceae	S	-
16	Bombax	*Bombax ceiba*	Malvaceae	T	-
10 sq.m plot in KBL4					
1	Common lantana	*Lantana camara*	Verbenaceae	S	LC
2	Coatbuttons	*Tridax daisy*	Asteraceae	H	-
3	Compact sedge	*Cyperus compactus*	Cyperus	H	LC
4	Benghal dayflower	*Commelina benghalensis*	Commelinaceae	H	LC
5	Tropical girdlepod	*Mitracarpus hirtus*	Rubiaceae	H	-
6	Water primrose	*Ludwigia hyssopifolia*	Onagraceae	H	LC
7	Gaint sensitive plant	*Mimosa invisa*	Fabaceae	S	-
8	Sensitive plant	*Mimosa pudica*	Fabaceae	S	LC
9	Sickle senna	*Senna tora*	Fabaceae	H	-
10	Sullu spurge	*Euphorbia sp*	Euphorbiaceae	S	VU
11	Eugenia	*Eugenia sp*	Myrtaceae	T	VU
12	Forked fimbry	*Fimbristylis dichotoma*	Cyperaceae	H	LC
13	Chinese sumac	*Rhus chinensis*	Anacardiaceae	ST	LC
14	Banana	*Musa sp*	Musaceae	H	-
15	Kassod tree	*Senna siamea*	Fabaceae	T	LC
16	Common bracken	*Pteridium aquilinum*	Dennstaedtiaceae	H	LC

17	Tiger grass	*Thysanolaena latifolia*	Poaceae	G	-
18	Caesarweed	*Urena lobata*	Malvaceae	S	-
19	Grasslike fimbry	*Fimbristylis miliacea*	Cyperaceae	H	-
20	Black nightshade	*Solanum nigrum*	Solanaceae	S	-
21	Shortleaf spikesedge	*Kyllinga brevifolia*	Caeyperace	H	LC
22	Common guava	*Psidium guajava*	Myrtaceae	S	LC
23	Blue tongue	*Melastoma affine*	Melastomataceae	S	-
24	Siam weed	*Chromolaena odorata*	Asteraceae	S	-
10 sq.m plot in KBL5					
1	Tropical girdlepod	*Mitracarpus hirtus*	Rubiaceae	H	-
2	Common bracken	*Pteridium aquilinum*	Dennstaedtiaceae	H	LC
3	Tiger grass	*Thysanolaena latifolia*	Poaceae	G	-
4	Siam weed	*Chromolaena odorata*	Asteraceae	S	-
5	Sickle senna	*Senna tora*	Fabaceae	H	-
6	Blue tongue	*Melastoma affine*	Melastomataceae	S	-
7	Caesarweed	*Urena lobata*	Malvaceae	S	-
8	Rubber	*Hevea brasiliensis*	Euphorbiaceae	T	-
9	earleaf acacia	*Acacia auriculiformis*	Fabaceae	T	LC
10	Common guava	*Psidium guajava*	Myrtaceae	S	LC
11	Bedgrass	*Ichnanthus sp*	Poaceae	G	-
12	Common lantana	*Lantana camara*	Verbenaceae	S	LC
10 sq.m plot in KBL6					
1	Crepe ginger	*Cheilocostus speciosus*	Costaceae	H	-
2	Common lantana	*Lantana camara*	Verbenaceae	S	LC

3	Caesarweed	*Urena lobata*	Malvaceae	H	-
4	Common wireweed	*Sida acuta*	Malvaceae	H	-
5	Siam weed	*Chromolaena odorata*	Asteraceae	S	-
6	Bedgrass	*Ichnanthus sp*	Poaceae		-
7	Kassod tree	*Senna siamea*	Fabaceae	T	LC
8	Sensitive plant	Mimosa pudica	Fabaceae	H	LC
9	Bombax	*Bombax ceiba*	Malvaceae	T	-
10	Potatotree	*Solanum erianthum*	Solanaceae	S	-
11	Jujube	*Ziziphus jujuba*	Rhamnaceae	S	LC
12	Indian acalypha	*Acalypha indica*	Euphorbiaceae	H	-
13	Purple yam	*Dioscorea alata*	Dioscoreaceae	CL	-
14	Sullu spurge	*Euphorbia sp*	Euphorbiaceae	H	**VU**
15	Creeping smartweed	*Polygonum chinense* L.	Polygonaceae	S	-
16	Beechwood	Gmelina arborea	Lamiaceae	T	LC
Poisonous mushroom founded in the KB1 and KB2 points of propose project area					
1	Vomiting russula	*Russula emetica*	Russulaceae	-	
2	Bitter bolete	*Tylopilus sp*	Boletaceae	-	
3	Green-spored parasol	*Chlorophyllum molybdites*	Agaricaceae	-	
4	Earthball	*Scleroderma sp*	Sclerodermataceae	-	

Climber = CL, Fern = F, Grass = G, Herbs = H, S = Shrubs, Small Tree = ST, Tree = T, Bamboo = B, Mushroom= M, Least Concern – LC, DD – Data Deficient, VU – Vulnerable

Monitoring results of flora species during dry season survey

Table 34: List of flora species observed in dry season

Sr. No	Common name	Scientific name	Family	Habits	IUCN
1	Caesarweed	*Urena lobata*	Malvaceae	S	-
2	Creeping smartweed	*Persicaria chinensis*	Polygonaceae	CL	-
3	Crepe ginger	*Cheilocostus speciosus*	Costaceae	H	
4	Sensitive plant	*Minosa pudica*	Fabaceae	S	-
5	Common wireweed	*Sida acuta*	Malvaceae	S	-
6	Common lantana	*Lantana camara*	Verbenaceae	S	-
7	Cotton tree	*Bombax ceiba*	Malvaceae	T	-
8	Purple yam	*Dioscorea alata*	Dioscoreaceae	CL	-
9	Bluebell barleria	*Baleria cristata*	Acanthaceae	S	-
10	Velvet leaf bamboo	*Dendrocalamus brandisii*	Poaceae	B	-
11	Jujube	*Ziziphus jujuba*	Rhamnaceae	ST	LC
12	Siam weed	*Chromkolaena odorata*	Asteraceae	S	-
13	Tiger grass	*Thysanolaena latifolia*	Poaceae	G	-
14	Common guava	*Psidium guajava*	Myrtaceae	ST	LC
15	Spiny pigweed	*Amaranthus spinosus*	Amaranthaceae	H	-
16	Sickle senna	*Senna tora*	Fabaceae	S	-
17	Jackfruit	*Artocarpus heterophyllus*	Moraceae	T	-

18	False buttonweed	*Spermacoce stricta*	Rubiaceae	H	-
19	Hairy fig	*Ficus hirta*	Moraceae	S	-
20	Blue tongue	*Melastoma affine*	Melastomataceae	S	-
21	Tea	*Camellia sinensis*	Theaceae	S	DD
22	Mango	*Mangifera sp*	Anacardiaceae	T	-
23	Common bracken	*Pteridium aquilinum*	Dennstaedtiaceae	H	LC
24	Sullu spurge	*Euphorbia sp*	Euphorbiaceae	S	**VU**

Source: Based on second survey during December 2019

Monitoring results of Fauna Survey for wet season survey

Two different types of birds, 32 species of moth butterfly and caterpillar, and also 6 other insects were sighted during the survey activities. In addition to the field survey activities, opportunistic sighting, and interview with long term residents, and checking from literatures were conducted to identify species found in the area. They are described in Table 35.

Table 35. List of fauna species around the project area during the wet season

Sr. No	Common Name	Scientific Name	Family Name	IUCN
	Bird			
1	Scarlet minivet	*Pericrocotus speciosus*	Campephagidae	LC
2	Shikra	*Accipiter badius*	Accipitridae	LC
	Moth, Butterfly and Caterpillar			
1	Indo-Chinesestraight pierrota	*Caleta roxus roxana*	Lycaenidae	-
2	Common emigrant (F)	*Catopsilia pomona*	Pieridae	-
3	Mottled emigrant	*Catopsilia pyranthe*	Pieridae	-
4	Common emigrant (M)	*Catopsilia pomona*	Pieridae	-
5	Blue admiral	*Kaniska canace*	Nymphalini	-
6	Common leopard butterfly	Indo-Chinesestraight pierrot	Nymphalidae	-
7	Black-spotted labyrinth	*Neope muirheadii*	Nymphalidae	-
8	Striped blue crow (M)	*Euploea mulciber*	Nymphalidae	-

Sr. No	Common Name	Scientific Name	Family Name	IUCN
9	Punchinello	*Zemeros flegyas*	Riodinidae	-
10	Common five-ring	*Ypthima baldus*	Nymphalidae	-
11	Club silverline	*Cigaritis syama*	Lycaenidae	-
12	Grey count	*Tanaecia lepidea*	Nymphalidae	-
13	Common imperial	*Cheritra freja*	Lycaenidae	LC
14	Yellow pansy	*Junonia hierta*	Nymphalidae	LC
15	Common sailor	*Neptis hylas*	Nymphalidae	-
16	Tamil ace	*Thoressa sitala*	Hesperiidae	-
17	Forget-me-not	*Catochrysops strabo*	Lycaenidae	-
18	Common castor	*Ariadne merione tapestrina*	Nymphalidae	-
19	Dark grass-brown	*Orsotriaena medus*	Nymphalidae	-
20	Common grass yellow	*Eurema hecabe*	Pieridae	-
21	Margined hedge blue	*Lycaenopsis marginata*	Lycaenidae	-
22	Chocolate tiger	*Parantica melaneus*	Nymphalidae	-
23	Common mormon	*Papilio polytes*	Papilionidae	-
24	Lemon pansy	*Junonia lemonias*	Nymphalidae	-
25	Common tiger	*Danaus genutia*	Nymphalidae	-
26	Long-branded bushbrown	Long-branded bushbrow	Nymphalidae	-
27	Lemon pansy (larvae)	*Junonia lemonias*	Nymphalidae	-
28	Ruby tiger (larvae)	*Phragmatobia fuliginosa*	Erebidae	-
29	Sunda green Vishnu-moth (larvae)	*Trabala viridana*	Lasiocampidae	-
30	Drury's jewel	*Cyclosia papilionaris*	Zygaenidae	-
31	Unknow catepillar	*Cyclosia panthona*	Zygaenidae	-
32	Lemon pansy (larvae)	*Junonia lemonias*	Nymphalidae	-
	Other insects			
1	Black-winged grasshopper	*Dissosteira carolina*	Acrididae	-
2	Japanese pine sawyer	*Monochamus alternatus*	Cerambycidae	-

Sr. No	Common Name	Scientific Name	Family Name	IUCN
3	Giant golden orb weaver	*Nephila pilipes*	Araneidae	LC
4	White footed ant	*Technomyrmex albipes*	Formicidae	-
5	Formosan termite	*Coptotermes formosanus*	Rhinotermitidae	-
6	Eastern pygmyfly (male)	*Nannophya dalei*	Libellulidae	LC

Least Concern – LC

Source: Based on survey in September 2019 during wet season

Monitoring results of Fauna Survey for dry season survey

Table 36. List of fauna species around the project area during the dry season

Sr. No	Common name	Scientific name	Family	IUCN
Butterfly and Moth				
1	Mottled emigrant	*Catopsilia pyranthe*	Pieridae	-
2	Silvery blue	*Glaucopsyche lygamus*	Lycaenidae	-
3	Common sailor	*Neptis hylas*	Nymphalidae	-
4	Chocolate pansy	*Junonia iphita*	Nymphalidae	-
5	Psyvhe	*Leptosia nina*	Pieridae	-
6	Common emigrant (F)	*Catopsilia pomona*	Pieridae	-
Fish				
1	Silond catfish	*Silonia silondia*	Schiibeidae	LC
2	Rhodeus	*Rhodeus laoensis*	Cyprinidae	VU
3	Mrigal	*Cirrhinus mrigala*	Cyprinidae	LC
4	Long whiskers catfish	*Mystus gulio*	Bagridae	LC
5	Ray finned fish	*Scaphognathops bandanensis*	Cyprinidae	VU

Source: Based on survey during dry season

General Fauna Species during dry season and wet season

According to local hunter, this plantation around the project area serve as a natural habitat for some mammal likes tiger, elephant, wild boar, deer, bear, snakes, tortoise, boar, squirrel, and pigeon. In recent years, some Centipede and Millipede species including colorful scorpion species are frequently observed by the local people. Moreover, the biological survey was conducted to cover along the access road and immediate. Based on the collection from the fishermen who are living along the Thanlwin river, various kinds of fish are observed in the surrounding area of the project. All the animals and fish species found in the investigation are described in the following table 37 and 38.

Table 37. List of animal's species observed by hunter around the project area.

Sr. No	Myanmar name	Common name	Scientific name	Family name
1	Kyar	Tiger	*Panthera tigris*	Felidae
2	Kyant	Rhinoceros	*Dicerorhinus sumatrensis*	Rhinocerotidae
3	Sin	Elephant	*Dicerohinus sumatrensis*	Elephantidae
4	Sat	Sambar deer	*Rusa unicolor*	Cervidae
5	Taw wet	Wild boar	*Sus scrofa*	Suidae
6	Jhe	Barking deer	*Muntiacus*	Cervidae
7	Myouk lwe kyaw	Western Hoolock gibboon	*Hoolock hoolock*	Hylobatidae
8	Taung sate	Red serow	*Capricornis rubidus*	Bovidae
9	Wet won	Sun bear	*Helarctos malayanus*	Ursidae
10	Thamin	Eld"s deer	*Panolia eldii*	Cervidae
11	Thin Gway Gyat	Sunda pangolin	*Manis javanica*	Manidae
12	Mway Zeinn	Green Tree viper	*Trimeresurus stejnegeri*	Viperidae
13	Mway hauk	Cobra	*Naja mandalayensis*	Elapidae
14	Daung	Peafowl		Phasianidae
15	Aunk chin	Oriental pied hornbill	*Anthracoceros albirostris*	Bucerotidae
16	Sapargyi	Burmese python	*Python bivittatus*	Pythonidae
17	Joe	Rock pigeon	*Columba livia*	Columbidae
18	Ngat taw	Black drongo	*Dicrurus macrocercus*	Dicrurus
19	Aung loung ngat	Great hornbill	*Buceros bicornis*	Bucerotidae
20	Khywe tu wet tu	South American coati	*Nasua nasua*	Procyonidae

Sr. No	Myanmar name	Common name	Scientific name	Family name
21	Shint	Eastern gray squirrel	*Sciurus caroline*	Sciuridae
22	Taung leik	Asian forest tortoise	*Manouria emys*	Testudinidae

Source: Based on the baseline survey during wet season and dry season

Table 38. List of fish species observed by fisherman in Than Lwin river

Sr. No	Myanmar name	Common name	Scientific name	Family name
1	Nga pyay ma	Climbing perch	*Anabas testudineus*	Anabantidae
2	Nga Mounn Ma	Devil catfish	*Bagarius spp*	Sidoridae
3	Nga Yant	Chevron snakehead	*Channa Striata*	Channidae
4	Nga Kyinn	Ray-finned fish	*Cirrhinus mrigala*	Cyprinidae
5	Nga khu	Airbreathing catfish	*Clarias Batrachus*	Clariidae
6	Nga phyinn Tha Let	Banded gourami	*Colisa fasciata*	Osphronemidae
7	Nga kyee	Fossil cat	*Heteropneustes fossilis*	Heteropneustidae
8	Nga Myit Chinn	Roho labeo	*Labeo rohita*	Cyprinidae
9	Nga Zin Yainn	Striped dwarf catfish	*Mystus vittatus*	Bagridae
10	Nga Gonn Ma	Swamp Barb	*Puntius chola*	Cyprinidae
11	Nga Myuin	Silond catfish	*Silonia silondia*	Schilbeidae
12	Nga Bat	Wallago catfish	*Wallago attu*	Siluridae
13	Nga Mway Htoe	Colorful Eel	*Mastacembelus unicolor*	Mastacembelidae
14	Nga Shint Ne	Swamp eel	*Monopterus albus*	Synbranchiformes

Source: Based on the baseline survey during wet season and dry season

Flora observed in six plots around the proposed project (wet season)

Figure 22: Flora observed at KB1 (wet season)

			
CN – Chinese sumac SN –*Rhus chinensis* F -Anacardiaceae	CN- Malabar goose berry SN – *Melastoma clarkenum* F -Melastomaceae	CN- Yoruban bologi SN –*Crassocephalum rubens* F -Asteraceae	CN-Common bracken SN –*Pteridium aquilinum* F - Dennstaedtiaceae
			
CN- East Indian glory bower SN-*Clerodendrum colebrookianum* F - Lamiaceae	CN- Smilaxes SN –*Smilax perfoliata* F - Smilacaceae	CN- Velvet bean SN –*Mucuna pruriens*	CN- Black nightshade SN –*Solanum nigrum* F - Solanaceae

			
CN- Basket grass SN –Lomandra sp F -Asparagaceae	CN- Dwarf white bauhinia SN –*Bauhinia acuminata* F - Fabaceae	CN- Blackboard tree SN – *Alstonia scholaris* F - Apocynaceae	CN –Benghal dayflower SN -*Commelina benghalensis* F -Commelinaceae
			
CN- Jujube SN –*Ziziphus jujuba* F -Rhamnaceae	CN- Citron SN-*Citrus medica* F -Rutaceae	CN- Red lucky seed SN – *Adenanthera pavonina* F - Fabaceae	CN- Indian gooseberry SN –*Phyllanthus emblica* F -Phyllanthaceae

			
CN- Air yam SN –*Dioscorea bulbifera* F -Dioscoreaceae	CN-Snuff box sea bean SN – *Entada rheedii* F - Fabaceae	CN- Needlewood tree SN – *Schima wallichii* F - Theaceae	CN- Caesarweed SN –*Urena lobata* F - Malvaceae
			
CN- Hairy fig SN –*Fucus hispida* F -Moraceae	CN- Dwarf white orchid SN –*Duabanga grandiflora* F -Lythraceae		

Figure 23: Flora observed at KB2(wet season)

			
CN-Common lantana SN –*Lantana camara* F -Verbenaceae	CN- Singkrang SN – *Saurauia roxburghii* F - Actinidiaceae	CN- Drooping fig SN – *Ficus semicordata* F - Moraceae	CN-Tiger grass SN – *Thysanolaena latifolia* F -Poaceae
			
CN- Kenda SN –*Macaranga peltata* F -Euphorbiaceae	CN- Asian ticktrefoil SN-*Desmodium heterocarpon* F -Fabaceae	CN- Sweet chestnut SN – *Castanea sativa* F - Fagaceae	CN-Shikakai SN –*Acacia concinna* F -Fabaceae

			
CN- East Indian glory bower SN-*Clerodendrum colebrookianum* F - Lamiaceae	CN- Tea SN –*Camellia sinensis* F -Theaceae	CN- Bodhi tree SN –*Ficus religiosa* F -Moraceae	CN- Black-jack SN –*Bidens pilosa* F -Asteraceae
			
CN- Sambong SN –*Blumea balsamifera* F -Asteraceae	CN- Giant fern SN-*Angiopteris evecta* F -Marattiaceae	CN- Crepe ginger SN – *Cheilocostus speciosus* F - Costaceae	CN- Smilaxes SN –*Smilax perfoliata* F - Smilacaceae

			
CN- Hamilton's bamboo SN-*Dendrocalamus hamiltonii* F -Poaceae	CN- Velvet leaf bamboo SN- *Dendrocalamus brandisii* F - Poaceae	CN- Needlewood tree SN – *Schima wallichii* F - Theaceae	CN- Velvet bean SN –*Mucuna pruriens* F - Fabaceae

Figure 24: Flora observed at KB3 (wet season)

			
CN- Midnight horror SN – *Oroxylum indicum* F -Bignoniaceae	CN- Elephant rope tree SN – *Sterculia villosa* F - Malvaceae	CN-Shikakai SN –*Acacia concinna* F -Fabaceae	CN-Common lantana SN –*Lantana camara* F -Verbenaceae
			
CN- White siris SN –*Albizia procera* F -Fabaceae	CN- Dwarf white bauhinia SN –*Bauhinia acuminata* F - Fabaceae	CN- Velvet leaf bamboo SN- *Dendrocalamus brandisii* F - Poaceae	CN- Indian gooseberry SN –*Phyllanthus emblica* F -Phyllanthaceae

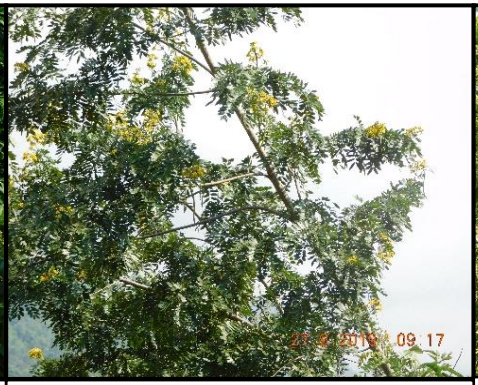
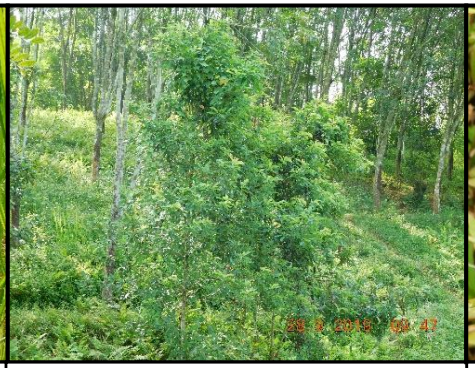
			
CN- Salpani SN – *Desmodium gangeticum* F -Fabaceae	CN- Kenda SN –*Macaranga peltata* F -Euphorbiaceae	CN- Kassod tree SN –*Senna siamea* F -Fabaceae	CN- Fragrant rosewood SN –*Dalbergia odorifera* F - Fabaceae
			
CN- White siris SN –*Albizia procera* F -Fabaceae	CN- Longsheath bamboo SN –*Thyrostachys siamensis* F - Poaceae	CN- Siam weed SN –*Chromolaena odorata* F -Asteraceae	CN- Bombax SN –*Bombax ceiba* F - Malvaceae

Figure 25: Flora observed at KB4 (wet season)

			
CN-Common lantana SN –*Lantana camara* F -Verbenaceae	CN- Coatbuttons SN –*Tridax daisy* F -Asteraceae	CN- Compact sedge SN – *Cyperus compactus* F - Cyperus	CN- Benghal dayflower SN –*Commelina benghalensis* F - Commelinaceae
			
CN - Tropical girdlepod SN –*Mitracarpus hirtus* F -Rubiaceae	CN- Water primrose SN-*Ludwigia hyssopifolia* F -Onagraceae	CN- Gaint sensitive plant SN – *Mimosa invisa* F - Fabaceae	CN- Sensitive SN –*Mimosa pudica* F -Fabaceae

			
CN-Sickle senna SN –*Senna tora* F -Fabaceae	CN- Sullu spurge SN – *Euphorbia sp* F - Euphorbiaceae	CN- Eugenia SN – *Eugenia sp* F - Myrtaceae	CN- Forked fimbry SN –*Fimbristylis dichotoma* F - Cyperaceae
			
CN – Chinese sumac SN –*Rhus chinensis* F -Anacardiaceae	CN- Banana SN-*Musa sp* F -Musaceae	CN- Kassod tree SN –*Senna siamea* F -Fabaceae	CN-Common bracken SN –*Pteridium aquilinum* F - Dennstaedtiaceae

			
CN- Tiger grass SN –*Thysanolaena latifolia* F -Poaceae	CN- Caesarweed SN – *Urena lobata* F - Malvaceae	CN- Grasslike fimbry SN – *Fimbristylis miliacea* F - Cyperaceae	CN- Black nightshade SN –*Solanum nigrum* F - Solanaceae
			
CN- Shortleaf spikesedge SN – *Kyllinga brevifolia* F -Cyperaceae	CN- Common guava SN-*Psidium guajava* F -Myrtaceae	CN- Blue tongue SN – *Melastoma affine* F - Melastomataceae	CN- Siam weed SN –*Chromolaena odorata* F -Asteraceae

Figure 26: Flora observed at KB5 (wet season)

			
CN- Tropical girdlepod SN –*Mitracarpus hirtus* F -Rubiaceae	CN-Common bracken SN –*Pteridium aquilinum* F - Dennstaedtiaceae	CN- Tiger grass SN –*Thysanolaena latifolia* F -Poaceae	CN- Siam weed SN –*Chromolaena odorata* F -Asteraceae
			
CN-Sickle senna SN –*Senna tora* F -Fabaceae	CN- Blue tongue SN – *Melastoma affine* F - Melastomataceae	CN- Caesarweed SN – *Urena lobata* F - Malvaceae	CN- Rubber SN –*Hevea brasiliensis* F -Euphorbiaceae

Figure 27: Flora observed at KB6 (wet season)

			
CN-Crepe ginger SN –*Cheilocostus speciosus* F -Costaceae	CN-Common lantana SN –*Lantana camara* F -Verbenaceae	CN- Caesarweed SN – *Urena lobata* F - Malvaceae	CN-Common wireweed SN – *Sida acuta* F - Malvaceae
			
CN- Siam weed SN –*Chromolaena odorata* F -Asteraceae	CN- Bedgrass SN –*Ichnanthus sp* F -Poaceae	CN- Kassod tree SN –*Senna siamea* F -Fabaceae	CN- Sensitive plant SN –Mimosa pudica F -Fabaceae

			
CN- earleaf acacia SN –*Acacia auriculiformis* F -Fabaceae	CN- Common guava SN-*Psidium guajava* F -Myrtaceae	CN- Bedgrass SN –*Ichnanthus sp* F -Poaceae	CN-Common lantana SN –*Lantana camara* F -Verbenaceae

			
CN- Bombax SN –*Bombax ceiba* F - Malvaceae	CN- Potatotree SN – *Solanum erianthum* F - Solanaceae	CN- Jujube SN –*Ziziphus jujuba* F - Rhamnaceae	CN-Indian acalypha SN –*Acalypha indica* F - Euphorbiaceae
			
CN- Purple yam SN –*Dioscorea alata* F -Dioscoreaceae	CN- Sullu spurge SN – *Euphorbia sp* F - Euphorbiaceae	CN-Creeping smartweed SN – *Polygonum chinense* L. F -Polygonaceae	CN- Beechwood SN –Gmelina arborea F -Lamiaceae

Figure 28: Poisonous mushroom founded in KB1 and KB2 of proposed project area (wet season)

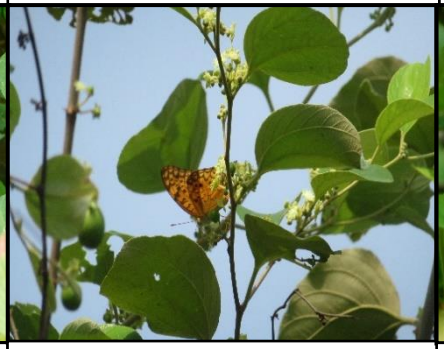
			
CN- Vomiting russula SN –*Russula emetica* F - Russulaceae	CN- Bitter bolete SN – *Tylopilus sp* F - Boletaceae	CN- Green-spored parasol SN –*Chlorophyllum molybdites* F - Agaricaceae	CN- Earthball SN –*Scleroderma sp* F - Sclerodermataceae

Fauna observed around the project area (wet season)

Figure 29: Bird Species during the wet season

	
CN- Scarlet minivet SN –Pericrocotus speciosus F - Campephagidae iucn- lc	CN- Shikra SN – *Accipiter badius* F -Accipitridae

Figure 30: Moths, Butterfly and caterpillar during wet season

			
CN- Indo-Chinesestraight pierro SN –*Caleta roxus roxana* F -Lycaenidae	CN-Common emigrant (F) SN – *Catopsilia pomona* F - Pieridae	CN- Mottled emigrant SN – *Catopsilia pyranthe* F - Pieridae	CN- Common emigrant (M) SN – *Catopsilia pomona* F - Pieridae
			
CN- Blue admiral SN –*Kaniska canace* F -Nymphalini	CN- Common leopard butterfly SN-*Phalanta phalanta* F -Nymphalidae	CN- Black-spotted labyrinth SN – *Neope muirheadii* F - Nymphalidae	CN- Striped blue crow (M) SN –*Euploea mulciber* F - Nymphalidae

			
CN- Punchinello SN –*Zemeros flegyas* F -Riodinidae	CN-Common five-ring SN – *Ypthima baldus* F - Nymphalidae	CN- Club silverline SN –*Cigaritis syama* F -Lycaenidae	CN- Grey count SN –*Tanaecia lepidea* F - Nymphalidae
			
CN- Common imperial SN –*Cheritra freja* F -Lycaenidae	CN- Yellow pansy SN-*Junonia hierta* F -Nymphalidae	CN- Common sailor SN – *Neptis hylas* F - Nymphalidae	CN- Tamil ace SN –*Thoressa sitala* F -Hesperiidae

			
CN- Forget-me-not SN –*Catochrysops strabo* F -Lycaenidae	CN-Common castor SN- *Ariadne merione tapestrina* F -Nymphalidae	CN- Dark grass-brown SN – *Orsotriaena medus* F - Nymphalidae	CN- Common grass yellow SN –*Eurema hecabe* F - Pieridae
			
CN- Margined hedge blue SN –*Lycaenopsis marginata* F -Lycaenidae	CN- Chocolate tiger SN-*Parantica melaneus* F -Nymphalidae	CN-Common mormon SN –*Papilio polytes* F -Papilionidae	CN- Lemon pansy SN – *Junonia lemonias* F - Nymphalidae

	
CN- Common tiger SN – *Danaus genutia* F - Nymphalidae	CN-Long-branded bushbrown SN –*Mycalesis visala visala* F - Nymphalidae

			
CN- Lemon pansy (larvae) SN – *Junonia lemonias* F - Nymphalidae	CN- Ruby tiger (larvae) SN-*Phragmatobia fuliginosa* F -Erebidae	CN- Sunda green Vishnu-moth (larvae) SN – *Trabala viridana* F - Lasiocampidae	CN- Drury's jewel SN –*Cyclosia papilionaris* F -Zygaenidae
			
CN- Unknow catepillar SN –*Cyclosia panthona* F -Zygaenidae	CN- Lemon pansy (larvae) SN – *Junonia lemonias* F - Nymphalidae		

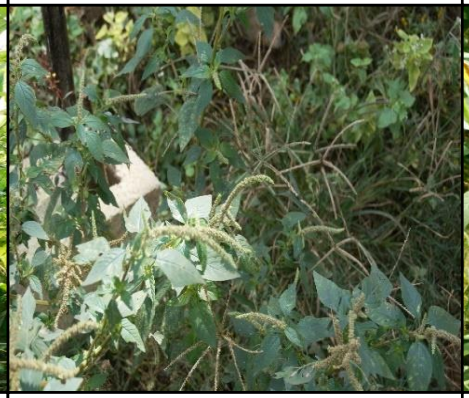
Figure 31: Other insects during wet season

			
CN- Black-winged grasshopper SN –*Dissosteira carolina* F -Acrididae	CN-Japanese pine sawyer SN –*Monochamus alternatus* F - Cerambycidae	CN- Giant golden orb weaver SN – *Nephila pilipes* F - Araneidae	CN- White footed ant SN – *Technomyrmex albipes* F - Formicidae
			
CN- Formosan termite SN –*Coptotermes formosanus* F -Rhinotermitidae	CN- Eastern pygmyfly (male) SN –*Nannophya dalei* F -Libellulidae		

Flora observed around the project and access road(dry season)

Figure 32: Flora observed during dry season

			
CN-Caesarweed SN-*Urena lobata* F -Malvaceae	CN-Creeping smartweed SN-*Persicaria chinensis* F -Polygonaceae	CN- Crepe ginger SN- *Cheilocostus speciosus* F - Costaceae	CN-Sensitive plant SN-*Minosa pudica* F -Fabaceae
			
CN-Common wireweed SN-*Sida acuta* F -Malvaceae h-s	CN-Common lantana SN –*Lantana camara* F -Verbenaceae	CN-Cotton tree SN-*Bombax ceiba* F -Malvaceae	CN- Purple yam SN –*Dioscorea alata* F -Dioscoreaceae

			
CN-Bluebell barleria SN-*Baleria cristata* F -Acanthaceae h-s	CN - Velvet leaf bamboo SN- *Dendrocalamus brandisii* F - Poaceae	CN- Jujube SN –*Ziziphus jujuba* F -Rhamnaceae	CN-Siam weed SN-*Chromkolaena odorata* F -Asteraceae
			
CN-Tiger grass SN – *Thysanolaena latifolia* F -Poaceae	CN- Common guava SN-*Psidium guajava* F -Myrtaceae	CN-Spiny pigweed SN-*Amaranthus spinosus* F -Amaranthaceae	CN- Sickle senna SN- *Senna tora* F - Fabaceae

			
CN-Jackfruit SN-*Artocarpus heterophyllus* F -Moraceae	CN -False buttonweed SN -*Spermacoce stricta* F -Rubiaceae	CN -Hairy fig SN -*Ficus hirta* F -Moraceae	CN- Blue tongue SN – *Melastoma affine* F - Melastomataceae
			
CN-Tea SN- *Camellia sinensis* F - Theaceae	CN-Mango SN-*Mangifera sp* F -Anacardiaceae	CN-Common bracken SN –*Pteridium aquilinum* F - Dennstaedtiaceae	CN - Sullu spurge SN- *Euphorbia sp* F - Euphorbiaceae

Fauna observed around the project (dry season)

Figure 33: Butterfly and moth observed during the dry season

			
CN- Mottled emigrant SN – *Catopsilia pyranthe* F - Pieridae	CN-Silvery blue SN-*Glaucopsyche lygamus* F -Lycaenidae	CN- Common sailor SN – *Neptis hylas* F - Nymphalidae	CN-Chocolate pansy SN- *Junonia iphita* F -Nymphalidae
			
CN-Psyvhe SN-*Leptosia nina* F -Pieridae	CN-Common emigrant (F) SN – *Catopsilia pomona* F - Pieridae		

Figure 34: Fish observed during the dry season

			
CN-Silond catfish SN-*Silonia silondia* F -Schiibeidae	CN-Rhodeus SN-*Rhodeus laoensis* F -Cyprinidae	CN-Mrigal SN-*Cirrhinus mrigala* F -Cyprinidae	CN-Long whiskers catfish SN-*Mystus gulio* F -Bagridae
			
CN-Ray finned fish SN-*Scaphognathops bandanensis* F -Cyprinidae			

5.9 Social Components

5.9.1 Methodology

The project site was situated in Kunlong township and the affected areas of the project sites are Holi village, Khaikpan village, Tone Kyat and Tadaoo village. In order to access the social economic conditions in Kunlong township and the affected four villages of the project site, the data and information such as population, household size, education, agriculture, livestock and fisheries, employment, income, humanitarian organization, environmental conservation activities, religious institutions, sports, entertainment and communications, energy utilization, water resource, solid waste and sewage management system, public health components, and cultural components, etc were gathered by both primary survey and desktop studies during September, 2019. The primary data and information for the village level are collected by the random sampling method.

The secondary data and information for township level were obtained from the https://themimu.info/township-profiles?field_doc_ tx_state_regions_tid=53. The primary data for socio-economics analysis of the village level were collected by doing survey in the affected areas of Kunlong township during the month of September 2019, and some reliable primary and secondary data were gathered from the village tract administrative office. The primary data such as household size, education, religion, ethics, literacy, livelihood, education, income, employment, energy utilization, water resource, solid waste and sewage management system, sport, entertainment and communication for the village level are collected. The secondary data collected in the affected villages are no. of household, no. of school, population, religious institution and humanitarian organization. The socio-economics analysis for township level and village level were done by the descriptive analysis with tables, picture, pie chat and figure, etc. The social survey assessment by the survey team was recorded with the photo (See in Annex 12.7).

5.9.2 Social Economic Situation in Kunlong

Kunlong Township is situated in Lashio area of Northern Shan State but at the western part of Ho Pan Township and the eastern part of Thein Ni Township and Kut Khaing Township. Lauk Kai Township is located in the northern part of Kunlong. As a part of affected area investigation study, the socio-economic investigation is primarily focused on the affected areas and 4 villages to be exact in Kunlong Township.

In Kunlong Township, Holi village and Khaik Pan Village under Holi Village tract, Tadar Oo village of Tadar Oo village tract and Tone Kyat village of Tone Kyat village tract fall in the project affected area that are likely to experience the socio-economic effects of the project. Primary emphasis of the investigation for socio-economic situation of the area was conducted in October 2019 and will capture socio-economic status, protected items, and potential advantages and disadvantages of the project on the local populace. Village tract level administrative offices provided data related to socio-economic status of the project area.

In terms of Net Gross Domestic Product (GDP), the distribution of each sector (Goods, Trade and Service) at Kunlong Township is shown in **Figure 35** Per capita income in Kunlong Township is 767,583 Kyats in 2017-18.

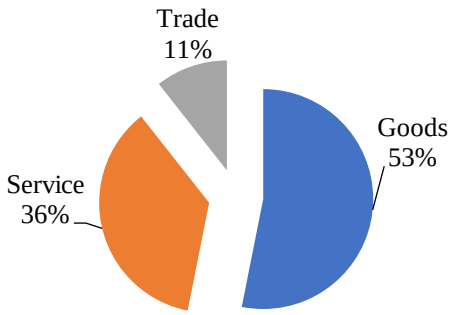


Figure 35: GDP in Kunlong Township

5.9.2.1 Population Growth and Distribution

a. Kunlong Township

The current population of Kunlong Township is 57,501 with 5,837 people in township area, and 51,664 people in the rural areas. The width of Kunlong Township is 379.39 square miles in size, involving in 0.375 square miles for urban area with 6 quarters and rural area consisting of 25 village groups with 173 villages. Overwhelming majority of Kunlong residents are Koe Kant (67.66%) while the rest constitutes Kachin (11.25%), Wa (Lwae La) (7.8%), Myaung Zee (5.07%), Shan (4.45%), Burmese (2.46%), and the others. Among them, 42.31% are Buddhists while the rest constitutes Christian (12.19%), Hindu (13.94%), Islam (0.09%) and others (45.4%). The population growth rate is 0.002% and the ratio of male and female is 1.01:1. The distribution of household for rural and urban area of Kunlong Township can be seen in the following **Figure *36***.

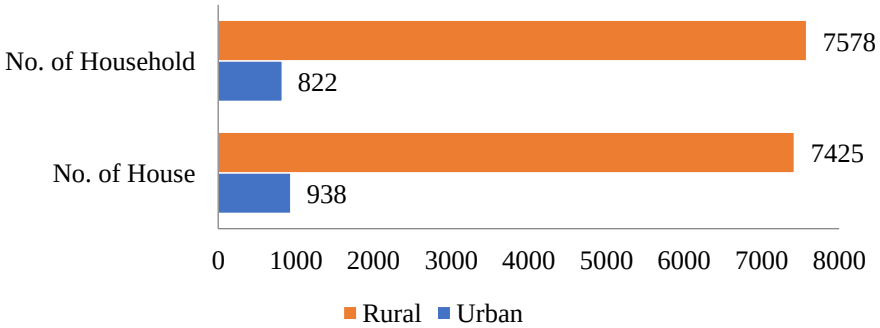


Figure 36: Household distribution in rural and urban of Kunlong Township

The data from *Table 39* indicates that 58.60 percent of the populations were above 18 years old, and 41.39 percent were under 18 in the urban areas while 60.13 percent and 39.86 percent of the populations were above 18 and under 18 years old in the rural areas. The relatively low proportion of population under 18 was due to the low fertility level especially in

the urban areas. The number of male and female (above 18 years old) in urban areas are less than those of in rural areas. For the number of male and female (below 18 years old) between urban areas and rural areas, the similar trend was observed.

In **Figure *37***, the percentage of male (above 18 years old) in both rural areas and urban areas is not too different with the percentage of female (above18 years old). The similar trend was observed between the percentage of male and female (under 18 years old).

Table 39. Population Distribution of Male and Female in Rural and Urban of Kunlong Township (2018)

No.	Categories	above 18 years			Under 18 years			Total		
		Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
1	Urban	1624	1797	3421 (58.60)	1243	1173	2416 (41.39)	2867	2970	5837
2	Rural	15554	15513	31067 (60.13)	10477	10121	20598 (39.86)	26031	25634	51665
	Total	17178	17310	34488	11720	11294	23014	28898	28604	57502

Source:https://themimu.info/sites/themimu.info/files/documents/TspProfiles_GAD_Kunlong_2018_MMR.pdf

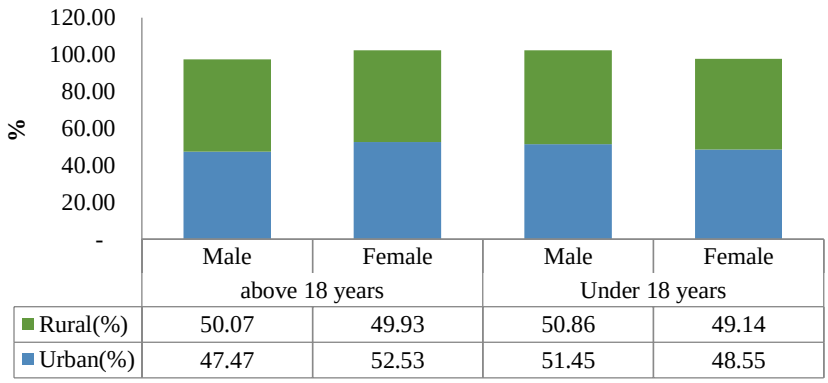


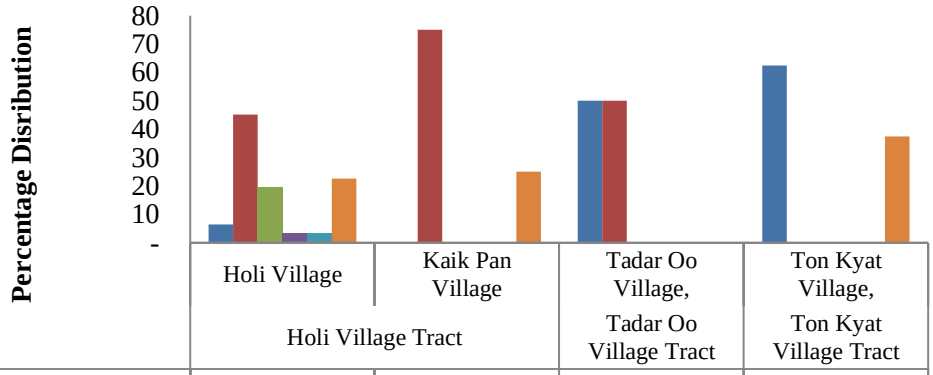
Figure 37: Male and Female Distribution in rural and urban area of Kunlong Township (2018)

b. Village Tract

Holi Village tract with 320 households hosts the population of 2,000, whereas Khaik Pan Village of Holi village tract with 18 households has the population of 80. Tadar Oo village has reportedly 120 households while Tone Kyat village with 270 households has the total population of 1653.

In terms of ethnicity distribution in Holi Village, Kachin overwhelmingly constitutes majority subsequently followed by Mone or Law Waw (23%), Ko Kant (19%), and a handful number of Burman, Shan and Palung. Similarly, in Kaik PanVillage, majority (75%) of total household are Kachin, and Mone or Law Waw constitutes 25%. In Tadar Oo Village, Kachin

and Burma are equal majority groups by (50%) of total household respectively while majority (62.5) of total households in Ton Kyat village are Burman followed by Mone or Law Waw (37.5%). (Figure 38).



	Holi Village Tract		Tadar Oo Village Tract	Ton Kyat Village Tract
Enthnicity, Burma	6	0	50	62.5
Enthnicity, Kachin	45	75	50	0
Enthnicity, KoKhan	19	0	0	0
Enthnicity, Palaung	3	0	0	0
Enthnicity, Shan	3	0	0	0
Enthnicity, Others(Mone/Law Waw)	23	25	0	37.5

Figure 38: Distribution of Ethnicity in the project affected area of Kunlong Township

5.9.2.2 Household Size

The term "household" is generally used to refer to a social group of people who live, work, and eat together (Siegel and Swanson, 2004). For the purpose of this study, the term "household size" has been used to refer to the number of peoples who usually resides in the household and shares household expenses ('common' kitchen) (Kamuzora, 2002). This definition puts together people like parents, children, and any other person who cooperate in the daily economic and social life.

Table 40. Distribution of Household Size in the selected study areas of Kunlong Township

No.	Household Size	Holi Village Tract (VT)		Tadar Oo VT	Ton Kyat VT
		Holi Village	Kaik Pan Village	Tadar Oo Village	Ton Kyat Village
	%	%	%	%	%
1	(1-3)	9.68	-	25	-
2	(4-7)	54.84	25	25	75
3	(8-11)	35.48	75	50	25
	Total	100	100	100	100

Source: Based on primary survey, September 2019

The survey of the distribution of average household size in the four villages, ranging from 1-3, 4 -7, and 8 -11 members, found that majority (54.84%) of households have between 4 and 7 family members followed by households with between 8 and 11 family members

(35.48%) in Holi village while majority of total households (75%) has between 8 and 11 family member and 25 percent has between 4 and 7 family members in Khaik Pan village. In Tadar Oo village, half of total household has between 8 and 11 family members while 25% was occupied by the groups between 1 and 3 and between 4 and 7 family members. For Tone Kyat village, majority (75%) of total household has between 4 and 7 family members while the rest 25 percent has between 8 and 11 family members.

A household study in 2019 finds domination in male distribution is common throughout the area. The age distribution showed that majority of the residents are adults between 36 and 60 and very few percent is above 60 years old in the area, in accordance with the study.

5.9.2.3 Literacy and Education

a. Literacy in Kunlong Township

Education is a very important characteristic of a person as it determines his/her level of understanding and interaction with the surrounding environment (URT, 2003a). Also, education is the most important tool for developing human skills, knowledge and liberating people from poverty (URT, 1999). Of which total population (57,502) of Kunglon Township, 42,523 are above 15 years old which is literate to 32,580. So, the overall literacy rate in Kun Long Township is 77%.

b. *Literacy in Village Tract at Kunlong Township*

Analysis of education level in the rural areas is of particular importance as it can be used to interpret increased skills levels. The data can be useful for productive investment. In Holi Village Tract, a high school and a primary school are in place but there is no school in Khaik Pan Village. A primary school each was found in Tadar Oo village and Tone Kyat village. Generally, a fair percentage of peoples from the area completed high school level education and very few peoples claimed to have no education.

Students who completed primary education in Tadar Oo village and Tone Kyat village have to go to near Holi village in Kunlong Township which has the Basic Education High School (BEHS) for their further education. The students in Khaik Pan Village have to go to Holi village for both primary and high school.

5.9.2.4 Livelihood and Income

a. Agriculture and Forestry, and Livestock

Kunlong Township is located on the mountainous areas and the so called “Mainmahla” mountain was lying from east to west in the areas of Kunlong Township. Moreover, TanLwin River, Nant Tain stream and Nan Lin stream are flowing famously in the township area. So, it is offering the fertile land and abundant water source for its agriculture lying above 1,413 feet sea level and the highest mountain was “Tar Shwe Htan” with the height of 7,171 feet.

For environmental conservation, total reserved forest areas cover (8,028) acres. Commercial forest area covers 915 acres, which include teak.

Six out of top ten Myanmar national priority crops, rice, peanut, sesame, sunflower, green gram, mung bean, pigeon pea, cotton, sugarcane and corn, are cultivated in Kunlong Township in 2018. Monsoon rice stands the highest rate of cultivation (49%) followed by sugarcane (26%), maize(rainy) (24%) then the other crops such as maize(winter), sesame(rainy), pigeon pea(rainy), and sunflower was found only a few percentages. Moreover, there are six kinds of perennial plants namely Thit Seint (Makalaw), fruit tree, tea plant, coffee and pepper in Kunlong Township.

Beef and sheep/goat are the leading livestock products in 2017-18 . Total egg production from chicken and duck are 21,465(98%) and 400(2%), respectively.

b. Employment

Local administrative information from 2017-2018 fiscal year stated that the employment rate of Kunlong Township is 98%. 32,835 peoples are reportedly employed, especially in agriculture sector. The information also added that the un-employment rate is about 1.21 % of the total population. The following table shows the distributions of employment by sector in Kunlong Township. Majority of the population (53%) was involved in agriculture sector while some (28%) engaged in daily worker as mason (See Figure *39*).

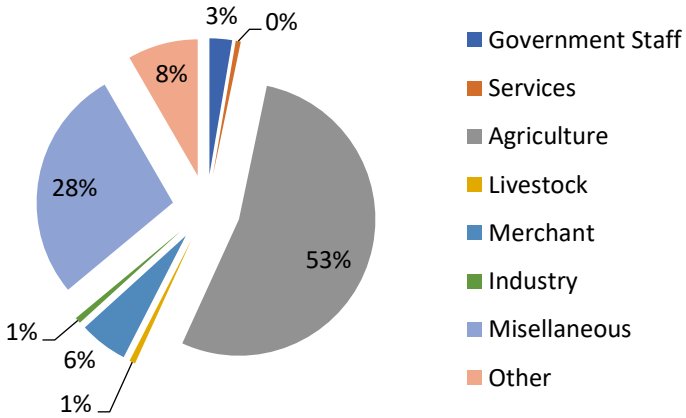


Figure 39: Population based on their employment

c. Income

Majority of the households (84 %) in Holi village earn between 100,000 and 400,000 Kyats per month. And only 3% makes between 1,500,000 and 2,500,000 Kyats per month. At Khaik Pan Village, all of the household earn between 100,000 and 400,000 Kyats per month. For Tadar Oo village and Tone Kyat village, majority of total household earn between 100,000 and 400,000 Kyats per month followed by 25% and 37.5% in making between 400,000 and 800,000 Kyats per month. It can be seen that there is no household who makes less than 100,000 Kyats per month and the highest income between 1,500,000 and 2,500,000 Kyats per month is seen only in Holi village. Being located at the important point for trade in the northeast part of Myanmar, most people's gain economics benefit from their farm production, livestock

breeding and own business leading to the proper income distribution while some enjoys the higher income from lucrative businesses.

In fact, all households own their houses in all affected villages. Specifically, 58.1 percent of total household are living in the houses made of brick followed by 35.5% in the houses made of wood and 6.5% in the houses made of bamboo in Holi village. But 50% of total household in Khaik Pan Village are living in the woodhouse while another 50% are in the bamboo-house. But all houses in Tadar Oo are made of brick. At Tone Kyat village, half of the houses are made of brick while another half is made of wood.

5.9.2.5 Humanitarian organizations

According to Regional Information of Kunlong Township, total of five Non-Government Organizations (NGOs) are operating in the area. These are the local branch of women affair organization with 7,412 members, maternal and child affair organization with 17,217 members, retired soldier affair association with 67 members, Red Cross with 276 members, and fire brigade with 207 members. In addition, one locally organized community for Koe Kant ethnic and culture is active.

In the proposed project affected villages, women welfare community, Law Waw Church Association, Kachin Bu Church (KBC), and Social Welfare Association were found in Holi village while social welfare community was only found in Tadar Oo village. There is no organization in Khaik Pan Village and Tone Kyat village.

5.9.3 Environmental conservation activities

In the fiscal year of 2017-2018, public owned forest area for (42) acres and mixed crops cultivation with forest area for (30) acres were run by the government together with the private sector. Moreover, Teak, Pyin Ka Toe, Yae Tin Win, and Maezalae have been planted by the government together with the local peoples totaling 25000 plants. Additionally, the awareness training for environmental conservation was organized by the government together with the regional forest organization and 15 trainees attended the training.

5.9.4 Living conditions and access to public services

a. Religious institutions

There is one Church Building in Holi Village and Tone Kyat. Majority, 74.19%, of the Holi village is Christian followed by 25.80% in Buddhist while all total households in Khaik Pan Village are Christians and all households in Tone Kyat Village are Buddhist. In Tadar Oo village, Buddhist and Christians are equally distributed by 50% each.

b. Sports, Entertainment and communications

An arena and gymnasia are available for sports or entertainment events in Kunglon Township. Popular sports include football, volleyball, basketball, and golf. A park for recreation and entertainment was observed but no movie theatre was found to be operational.

For information and entertainment in the villages, majority of total households in Holi village and Tadar Oo village depend on both newspaper and social network while some depend on only on newspapers, social network, and words of mouth. In Khaik Pan Village, the entire

village obtains information from social network. However, majority of total household in Tone Kyat village rely on TV and social networks for their information and entertainment while some choose to rely on only social networks and words of mouth. Increasing trend in the use of mobile phone is observed in those villages.

c. Energy Utilization

In terms of energy utilization, electricity is available in Holi village, Tadar Oo village, and Tone Kyat village. However, 94% of total household in Holi village are using electricity and the rest are using power from battery and solar energy. All households get power supply in Tadar Oo and Tone Kyat village. At Khaik Pan Village, there is not electricity available. 50 percent of total household depends both on battery and solar energy while the last 25 percent is using only solar energy for their energy utilization. While some places receive electrical power, majority of the population in this area still depend heavily on firewood and charcoal for cooking.

d. Water resource

Creek serves as major water source for Holi village and Tadar Oo village and some use spring water which is flowing down from the mountains for their daily life. In Khaik Pan Village, water supply for all households flows down from the mountains while majority of household in Tone Kyat Village rely water from tube wells. Some use water from creek and water flowing down from the mountains.

e. Solid Waste and Sewage Management System

Waste burning is abundant in all villages. All households store solid wastes at a designated place and burn them. No municipal solid waste management system could be seen in the area. The majority (68%) of household in Holi village feed the disposal of perishable things and scraps to the animals and some disposed it to the designated place or in the ditch/runnel or sometimes burn it while all households in the remaining three villages feed the disposal of perishable things and scraps to the animals. However, the area itself is relatively clean without littering trashes but occasionally, illegally dumped litters could be observed in bushes and runnels. Awareness level of health effects from burning wastes could be concluded as high as everyone seems to understand the health issues associated with burning trashes but at the same time, everyone believes that it is the only solution to dispose trash.

Every household seems to have individual onsite septic system and no municipal wastewater pumping or treatment system could be found in the area. Majority of total household in Holi village and Tadar Oo village has concrete toilet while majority of total households in Tone Kyat village have wooden toilets. However, all households in Khaik Pan Village have wooden toilet. Generally, flush toilet and squat toilet systems have been observed in households.

5.9.5 Public Health Components

Morbidity is in poor state for both acute and chronic diseases. Many of the leading causes of morbidity in Myanmar are associated with communicable diseases and pregnancy/childbirth.

In the project affected villages, hypertension, diagnoses, influenza (blood), skin itching, diarrhea and lung, TB, liver, dengue fever, and seasonal flu are generally complained by the respondents of four villages while everyone seems to agree that malaria incidents become rare in the area lately. Specifically, majority of total household in the Holi village, Khaik Pan Village and Tone Kyat village complains the seasonal flu and sometimes dengue fever while total household in Tadar Oo village complains of hypertension/diagnoses, diarrhea and lung, TB, and seasonal flu.

5.9.6 Cultural Components

a. History of the Location

In the ancient kingdom period, Caliphate/ Soviet Rule (Hcaw Bhwar) governed the Kunglon Township. "Kyun Gyi" is located at the confluence of the "Than Lwin River and Nant Tain Stream". The origin of Kunglon Township came from "Kyun Gyi". In the year of 1962, the district office was established in Kunglon Township then it was transferred to the General Administration Department (GAD) under Ministry of Immigration in 1965. Since 2018, GAD has been again transferred under Ministry of Union Office.

b. Cultural Heritage

Living heritage sites, well known to the local residents, are pagoda complexes, shrines, and monasteries, located within human settlements. There are no famous ancient buildings and places in Kunglon Township. Isolated burial sites in accordance with Chinese tradition could also be observed in various places. The famous pagoda and monasteries are found as per follow in Table 41:

Table 41. Famous pagoda and monastery in Kunglon Township

No.	Name	Location
	Famous Pagoda	
1.	Tadar Oo Shrine	Staff Qt
2.	Shwe Phone Pwint Shrine	Pan Sann Nant Village
	Famous Monastery	
1.	Htaye Ya War Da Buddha Sasanarpyu (Central)	Nyar Na Tetpann Qt.

Source: https://themimu.info/sites/themimu.info/files/documents/TspProfiles_GAD_Kunglon_2018_MMR.pdf

c. Description of traditional knowledge, beliefs, and cultural practices

Although no special cultural heritage with regard to tradition and ritual practices were mentioned in interviews with villagers and stakeholders, common festivals and religious events are water festival, Myanmar New Year, and Chinese New Year, full moon day of Tabaung, and taking monastic order ceremony. Church complex and monasteries are the center of religious life in this part of Myanmar.

Project site does not consist any evidence of cultural and heritage importance. However, any chance find cultural and heritage matters will be treated with extreme care and will be conserved. If there is any event of chance find, relevant authorities such as cultural and heritage departments and archeology department will be informed immediately, and any project activity will be put on a halt until the clearance is granted by the authorities concerned.

6.0 IMPACT AND RISK ASSESSMENT AND MITIGATION MEASURES

6.1 Objectives for Conducting ESIA

DOB's policy and Myanmar environmental conservation laws, regulations, and procedures necessitate the project to adhere with environmental and social requirements. DOB has made strong commitment to avoid adverse environmental and social impacts from its projects and only after DOB has exhausted all possible options to proactively prevent adverse impacts, DOB shall resort to seek equivalent mitigation measures to negate its footprints in every stage of the project. In order to supplement DOB's options and alternatives, DOB has determined to perform ESIA as early as required by ECD's Procedures and develop prevention and mitigation mechanisms. Environmental and social impacts of the project are assessed and projected and at the same time, resettlement action plan (RAP) and ethnic minority management plan (EMMP) are articulated as parts of the ESIA for the project.

6.2 Methodology for Impact and Risk Assessment

The assessment of environmental impacts is carried out in two steps: identification of impacts and evaluation of impact assessment. These two steps were described as follows.

6.2.1 Identification of Impacts

The project's environmental and social impacts assessments involve the study of existing environmental and social conditions, examination of project's activities, and pollution generating potentials, and thorough investigation of project's environmental pollution control systems and social management plans including resettlement action plan, ethnic minority management plan, working environment, health, and safety measures. Impacts and pollution potentials from every stage of the project' cycle, namely pre-construction phase, construction phase, operation phase, and de-commissioning phase, are envisaged and measured to formulate effective environmental and social management plan (ESMP) in conjunction with RAP and EMMP.

Secondary information necessary to use in the impact assessments were obtained from various sources. Desktop study about the project area described general conditions of the project area. Air, noise, and vibration surveys, water and groundwater quality assessment, soil condition examination, biological and forestry surveys, socio-economic surveys, and public consultations conveyed existing data for the environmental and social impact assessments. A thorough environmental study and a focused public consultation have been included in the ESIA.

The project proponent provides all necessary detail information including but not limited to project background, project planning, all project development activities, project operation processes, and its environmental control systems and waste management together with all environmental and social safeguards policies. These data together with background data, which have been established from the field survey, facilitate the environmental team to assess environmental and social impacts. Integrating comprehensive background data and

assessments of potential impacts enhance the environmental team and the project proponent to develop meaningful and practical ESMP that is relevant to the project and its projected impacts.

6.2.2 Evaluation of Impact Assessment

The methodological approach followed is adapted from the impact assessment methods recommended by the World Bank (1991) and the International Finance Corporation (December 1998). The approach used to assess the project's environmental impacts determines the Intensity, Extent, and Duration of the anticipated positive or negative impact. These three qualifiers are grouped under one synthesis indicator, the significance of the impact. This indicator provides an overall assessment of the anticipated impacts on a given environmental component. The following figure schematically presents the basis process leading to an assessment of the impact's significance.

Although the impacts on the physical environment are described and quantified as accurately as possible, they cannot be assigned a value in and of themselves.

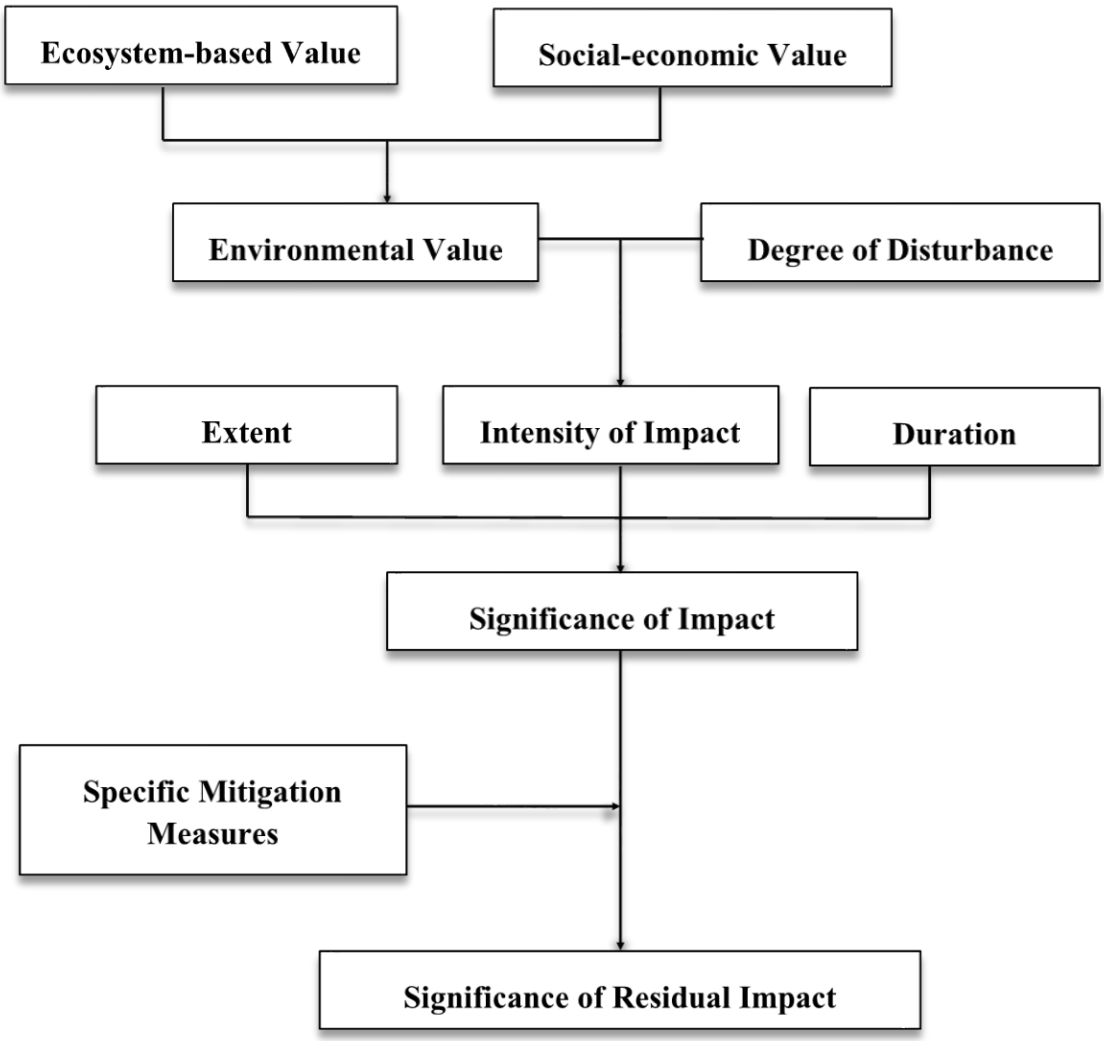


Figure 40: Impact Assessment Methodology

6.3 Identification of Project Affected Area, Receptors, and Stakeholders

The estimation of project affected area from a number of available models, compounded with the mist of reliable scientific background data for all environmental and social conditions of the project area in conjunction with the absence of current reliable data feed, makes it far from convincing to prove evidence-based decision. Therefore, a contemporary approach to demarcate project affected area and to identify stakeholders becomes important to come up with.

Identification of the project activities, projection of potential adverse effects in representative to the extent of possible pollution loads and issues, existing receptors and sensitivity conditions, duration of impacts, planned treatment mechanisms and their capacity, and predicted results for receiving adverse effects for such duration were weighted in the prediction consideration for impacts. In addition, positive, negative, direct impact, indirect impact, and cumulative impacts are all taken into account in identification of the project affected area, receptors, and stakeholders. Magnitude of the impacts, likelihood of the occurrence, intensity and severity of the issue based on the estimated negative results, and degree of confidence were included in the fundamental prediction of rating significance. Based on the environmental and social characteristics of the project area observed and researched in the environmental and social field surveys, affected areas for the project are identified.

The new bridge project will less likely to generate substantial environmental adverse impacts and none could pose as lasting impact either. Potentially considerable impact from altering the river's flow regime with regards to depth, velocity, deposit pattern, and river morphology would only be taken into account in the implementation plan. Despite having positive effects, major impacts in the form of economic impacts, disruption to normal lives of the communities, and loss of properties could not be overlooked. Therefore, the Environmental and Social Management Plan (ESMP) will emphasize on social factor carefully. Based on the studies, radiation of impacts from the bridge building would not reach beyond 1.5 Km radium of the project site. With this particular projection, Holi Village, Khaik Pan Village, and Tadar Oo Village fall into the project affected area. By considering all things, communities from above villages, general administrative departments and the other government agencies, traders, the bridge and road users, and a handful of fishermen near the new bridge site constitute as the key stakeholders for this specific project.

While building of the bridge is primarily the main theme of the project, ancillary facilities such as approach road are also included in the studies of environmental and social assessments. All environmental studies including air quality, water, soil, and biodiversity surveys covered the stretch of the planned approach road. Social studies also involved the communities and peoples from the area of the approach road. The maps for environmental and social surveys will show the area coverage inclusive of the area to cover the approach road (See Figure 41). These issues were discussed in the public consultation as well.

Thanlwin River's flow is commonly known as very turbulent and because of the rapid flow, only limited river transportation could be seen in the river. With the careful selection of

the bridge design to minimize impacts on the river, the effect on the river from the bridge and the approach road will be utterly minimal. Sand island forming as an immediate signal of noticeable impacts on the river water flow regime could not be observed in the area for bridge construction. The existing bridge has not led to the same effects and so will not be the new bridge. The approach road may not contribute to the impacts on the river's water flow regime.

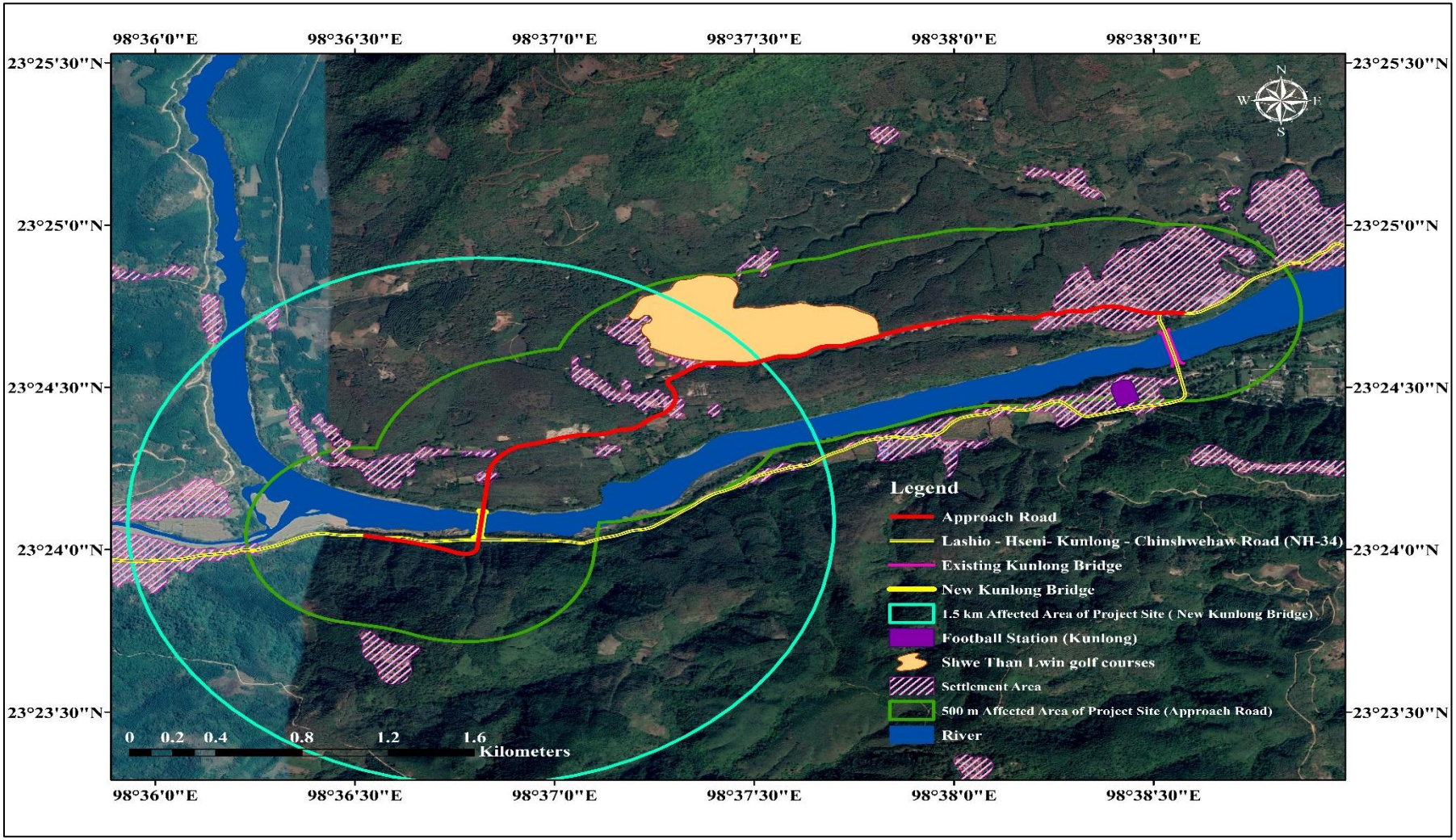


Figure 41: Map overlaying the study areas and the approach road

6.4 Impact identification, Assessment and Mitigation

6.4.1 Pre-construction Phase Impacts

In preconstruction phase, land assessment and construction surveys were carried out.

Potential Impact	Project Activities	Magnitude	Duration	Extent	Inten-sity	Sum of score	Degree of Significant
Loss of terrestrial habitat	Site clearing for assessments and surveys	4	3	3	4	14	M
Soil erosion	Partial land leveling and removing plant cover	2	2	2	2	8	VL
Disposal of earthen materials and plant debris	Site clearing for assessment / tree cutting	4	3	3	4	14	M

6.4.2 Construction Phase Impacts

Impact	Project Activities	Magnitude	Duration	Extent	Inten-sity	Sum of score	Degree of Significant
Effects on the river's flow regime							
Temporary alteration in the river's flow regime	Laying foundation	2	2	2	2	8	VL
Loss of terrestrial habitat							
Loss of terrestrial habitat	Land clearing for construction activities, and presence of construction crew	2	2	2	2	8	VL
Air Pollution							

Impact	Project Activities	Magnitude	Duration	Extent	Inten-sity	Sum of score	Degree of Significant
Air pollution emission	Uses of construction equipment	1	3	2	1	7	VL
	Construction vehicles movement	1	2	2	2	7	VL
Dust emissions	Shipping, loading and unloading of construction materials	3	3	1	2	9	L
	Stockpiles of construction materials	2	3	1	2	8	VL
	Excavating soils and activities related to earthworks	3	3	2	2	10	L
	Leaving exposed earth surface	2	3	1	2	8	VL
	Construction operations	3	3	4	4	14	M
Soil erosion, degradation and contamination							
Topsoil degradation and soil contamination by earthworks	Stockpiles of construction materials	3	3	4	4	14	M
	Compaction from	3	3	3	3	12	M

Impact	Project Activities	Magnitude	Duration	Extent	Inten-sity	Sum of score	Degree of Significant
	vehicle activities						
	Excavation of soils and activities related to earthworks	3	3	2	2	10	L
	Construction activities and crew's movement	3	3	3	3	12	M
	Disposal of construction spoils	3	5	2	2	12	M
Noise emission and Vibration							
Noise and vibration	Unloading construction materials	3	3	3	3	12	M
	Earth works	3	3	3	3	12	M
	Foundation pile driving operation	2	4	1	2	9	L
	Movements of heavy vehicles	3	3	3	3	12	M
	Construction activities and construction crew	4	4	3	3	14	M
	Back-up generator	2	2	2	1	7	VL
Solid waste generation							
Solid wastes and	Construction activities	3	4	3	4	14	M

Impact	Project Activities	Magnitude	Duration	Extent	Inten-sity	Sum of score	Degree of Significant
construction spoils	Shipping materials	2	2	2	2	8	VL
	Construction and management crews	3	3	3	3	12	M
	Discarded containers	2	3	1	1	7	VL
Social and Occupational health and safety impact							
Social adverse effects	Tension and conflicts between migrant workers and local communities	2	4	2	2	10	L
Community misinformation	Activities where communities are not adequately consulted	2	2	2	2	8	VL
Discrimination, gender equality, compliance with labor regulations	Refusal for workers with disabilities, discrimination over gender regard to pay rate and opportunities, disregards to overtime	2	3	2	1	8	VL

Impact	Project Activities	Magnitude	Duration	Extent	Inten-sity	Sum of score	Degree of Significant
	compensation						
Land acquisition and disadvantaged ethnic minorities	Land confiscation and leaving out minor ethnic minorities	4	4	4	3	15	M
Safety, risks, and health hazards	Disregard to use PPE, work related injuries, sickness, and fire incident	3	3	4	4	14	M

6.4.3 Operation Phase Impacts

Potential Impact	Related Activity	Magnitude	Duration	Extent	Intensity	Sum of score	Degree of Significant
Pollution and waste generation from occasional maintenance							
Pollution	Use of equipment and crew in maintenance activities	2	1	2	1	6	VL
Waste generation	Rehabilitation activities and spoils	2	1	2	1	6	VL
Traffic interference							

Potential Impact	Related Activity	Magnitude	Duration	Extent	Intensity	Sum of score	Degree of Significant
Blockage and delay leading to congestion	Insufficient inspection systems	2	2	2	2	8	VL
	Lack of proper traffic control and management during the maintenance	2	2	2	2	8	VL
Safety Risks in maintenance							
Accidents involving traffic interference	Inadequate planning, scheduling, and poor direction	3	4	3	2	12	M
The rise in the level of traffic flow							
Accidents involving the rise of traffic flow	Proper and adequate applications of traffic flow management and all safety procedures	3	4	4	3	14	M
Traffic congestion and blockage due to routine custom and security inspections							
Long road blockade and intolerable traffic congestion	Custom inspection and security clearance at the bridge crossing	3	4	4	4	15	M

Potential Impact	Related Activity	Magnitude	Duration	Extent	Intensity	Sum of score	Degree of Significant
Potential Hazards during natural and man-made disasters							
Risks and dangers	Natural and man-made disasters	2	2	2	2	8	VL
Social, Health, and Safety Impacts							
Lack of Job opportunity and priority status for local residents	Contractors only bringing their own crew from other areas	2	2	2	2	8	VL
Health and safety risks for workers	Improper management and lack of adequate coordination and planning	2	2	2	2	8	VL
Absence of mechanism to express grievances	No regular outreach program	2	2	2	2	8	VL
Traffic safety issues for the communities	Lack of traffic security applications, education, and shortage of routine improvement systems	3	4	4	3	14	M

6.4.4 Decommissioning, closure and post closure phases

Potential Impact	Related Activity	Magnitude	Duration	Extent	Intensity	Sum of score	Degree of Impact
Air, noise, and vibration pollution	Use of heavy machineries in decommission operations	2	1	1	1	6	VL
Scrap metals and solid waste generations	Demolition of the bridge	2	2	2	2	8	VL
Unemployment for DOB's bridge management workers	Decommissioning of the entire bridge and operation	2	2	2	2	8	VL

7.0 CUMULATIVE IMPACT ASSESSMENT

The new Kunlong Bridge project is located in an isolated area with no other factors that could contribute to cumulative impacts. In terms of accumulation, the project certainly does not constitute to be a contributing factor for any aspect of environmental impacts as its presence will not make much difference to the existing environment. However, the effects on the river's flow regime will be noticeable and will be observed closely. Even the effects on the river's flow regime is insignificant and moreover, the non-existence of the other systems that could be causing concerns to accumulate pollutants to a noticeable degree would further affirm that the project will not require cumulative impact assessment for the project.

Regardless of the non-requirements for the outlook of the project's contribution in environmental pollution, its' ESMP monitoring and evaluation will continue frequently as specified in the ESMP and the finding will look closely at the necessity of review on the decision to conduct future CIA if needed.

8.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Environmental and Social Management Plan (ESMP) is developed based on the finding from environmental and social impact assessment. The holistic ESMP addresses these environmental and social issues to avoid as best feasible as the project could and only after the options for avoidance have been exhausted, the project will opt to mitigate the impacts to the maximum plausible extent.

ESMP has employed all the best management practices to minimize and mitigate the potential impacts. With the application of these best management practices, the project aims to meet the guideline standards described in National Environmental Quality (Emission) Guideline (NEQEG) and to implement the project's environmental and social standards. All these best management practices tabulated in the ESMP will be religiously undertaken by the project in each phase of the project. In addition, DOB is committed to make reviews and re-examination of the efficiency of these practices on the basis of regular monitoring and evaluation results. Practically feasible adjustments and modifications will be updated with the emergence of available best management practices and applications. The ESMP fully endorses DOB's commitment to avoid, minimize, and mitigate footprints of environmental and social impacts as the result of the project.

8.1 Environmental and Social Management Plan for Pre-construction Phase of the New Bridge Project

Potential Adverse Effects	Mitigation measures adopted	Monitoring indicators	Responsible Party	Implementation schedule	Budget Allocated in US$
Loss of terrestrial habitats – from site clearing, assessment, and survey activities	- Assessing, marking, and careful removal plant species of any important value - Replanting these plants and conserving the plant coverage - Assessing wildlife activities - Providing green passages for wildlife activities	Existence of plant species that are in critical state Appearance of wildlife activities and continuous assess using green passages	The project management	Before the site clearing and after the construction	**500**
Soil erosion – from partial land leveling and removing top spoils Removal of trees and plants along the project path	- Careful removal of topsoil for conservation - Placement of wind and rain cover on the disturbed places - Reuse of removed topsoil for vegetation - Replanting trees and plants removed from clearing zone at a distance	Exposed soil surfaces Signs of soil degradation Forming channels from erosion Coverage of trees and plants in a different area along the path	A competent consulting firm	After site clearing and once a month before the completion of the construction	**1000**

Potential Adverse Effects	- **Mitigation measures adopted**	**Monitoring indicators**	**Responsible Party**	**Implementation schedule**	**Budget Allocated in US$**
Dust emission – from soil exacerbation	- Wetting exposed soil during the survey period - Placing removed plants and shrubs on exposed soil	Increase in dust and particles	The project management	After site clearing and once a month before the completion of the construction	**1000**
Disposal of earthen materials and plant debris – from land clearing /tree cutting	- Topsoils removed, and plant debris will be conserved for covering of exposed places - Recycling of these in the area, where trees and plants are replanted	Reuse as compost Utilization of these for re-greening	The project management	After site clearing and once a month before the completion of the construction	**500**

8.2 Environmental and Social Management Plan for Construction phase of the New Bridge Project

Potential Adverse Effects	Measures adopted	Monitoring indicators	Responsible Party	Implementation schedule	Budget Allocated
Effects on the river's flow regime					
Potentially temporary alteration in the river's flow regime by - Laying foundation - diversions	- Carry out at the lowest flow level and design the foundation to address effects on the flow regime. - Do the process quickly and effectively	Change in flow velocity Change in water quality	A competent hydrologist or an environmental engineering firm	Assessment prior to the construction and once a month monitoring	1000
Loss of terrestrial habitat					
Loss of terrestrial habitat by land clearing for construction activities	- Make pre-assessment of tree coverage and of known animal species of importance and document them - Try to conserve as much number of trees and plants as possible and regrow them in a distant area - Save topsoils for reapplication in the green belt. - Setting up passages for wildlife in and around the compound.	Tree coverage in the revegetation area Presence of wildlife species and activities	A competent environmental engineering firm	Assessment prior to the construction and once a month monitoring	Already covered in the pre-construction section

Air Pollution					
Air pollution emission from the uses of construction equipment, cranes, heavy vehicles, welding machines, generators, and steel cutter	- Management program to reduce number of vehicle trips and improvement to the sufficiency of the trip planning are integrated and implemented. - Equipment and machine operations are closely monitored, reviewed, scheduled, and minimized. - Revegetation area at a distance is established.	SOx, NOx PM2.5, PM10, Ozone	A competent environmental consulting firm	Monthly, [Air quality test will be carried out once a month during the construction period and NEQEG standard will be in compliance].	500
Emission from vehicle operations (trucks, cars, crane and motorcycles exhausts),	- Prohibit idling of vehicles when not in use. - Vehicles activities are managed with operational plan to reduce number of trips. - All vehicles are maintained regularly to reduce pollution loads from their emissions. - Transportation is provided for all workers from camps to reduce the number of transport vehicles.	SO2, NO2 PM2.5, PM10, Ozone	Main contractor and its subcontractors	Monthly Keep record of vehicle activities management and maintenance for environmental review and auditing.	Already covered in the construction phase air quality monitoring.
Dust emissions from shipping, loading and unloading of construction materials,	- All construction materials are required cover for shipments. 2.5 -meter-high screens will be erected along the peripheral of construction activities. - Water is frequently (3 times per day) sprayed to unpaved roads especially in construction site.	PM2.5, PM 10, NOx, and SOx Moisture level in topsoil Placement of covers on exposed soils	A competent environmental consulting firm	Monthly Daily checking on effectiveness of water spraying practice and making adjustments.	Already covered in the construction phase ambient air quality monitoring

Stockpiles of construction materials Excavating soils and activities related to earthworks Leaving exposed earth surface and Construction operations	- Education and training will be provided for relevant staff in suppressing dust. - Spraying of water will be applied before unloading to suppress dust. - Stockpiles for sand, dust, and gravel will be kept under the covers. - Spraying of water will be required first before each earthwork and the materials will be carefully moved to a stockpile. - Land clearing will be arranged immediately before the construction and spraying of water will be applied before and after the application. - Exposed earth surface will be put under a cover before construction.				
Soil erosion, degradation and contamination					
Topsoil erosion, degradation and soil contamination by following earthworks Stockpiles of construction materials	- Stockpiles of construction materials will be housed in designated areas, where land clearing and construction will be taken place. - Protective landscape planning and leaving buffer zone with constructions controlling runoff will be implemented. - Regreening on disturbed surfaces with locally adapted plant species to prevent erosion.	Sheet, ray, and gully erosion on slope and sedimentation and turbidity in nearby water ways	A competent environmental firm	Weekly monitoring on stockpiling of construction material and disposal of excavated soil. Monthly monitoring on soil erosion potential sources.	1000

Compaction from vehicle activities and soil contamination	- Vehicles parking areas and movements will be restricted to clearly marked or designated areas in order to reduce soil compaction and top soil degradation.	Construction site vehicle packing area Tyre marks and disturbances on undesignated places for parking or traffic activities.	A competent environmental firm	Weekly monitoring	Already covered in soil monitoring
Excavation of soils and activities related to earthworks	- In each and every earthwork, top soils will be carefully peeled off and stored properly. - Spraying water will be applied to the top soil layers at regular time interval to maintain acceptable moisture level. - Each earthwork will be closely supervised by a trained engineer and removed soils will be placed properly for later reuse. - Top soil layers that have been carefully peeled off and stored will be reutilized in greening of a designated area and if excess is available, will properly be placed in the surrounding or will be donated to the villagers for uses in their plantation.	Soil stock pile, Dust dispersal, General soil moisture content, Top soil and subsoil for different use	A competent environmental consulting firm	Weekly monitoring	Already covered in the soil monitoring cost.
Construction activities and crew's movement	- Construction activities and crew activities will be strictly confined to the areas where the towers will be put in place. - Activities outside of the project boundary will be minimized to protect soil compaction	Construction activities Evidence of activities outside of the construction zone	A competent environmental consulting firm	Weekly monitoring	Already covered in the soil monitoring

	and topsoil degradation by rule and regulation.				
Disposal of construction spoils	- Construction spoils will be placed only in a designated area. - The materials will be reused for regreening and land applications. - If there is demand, these spoils will be sold.	Type of spoils High and slope of construction spoils stockpile Potential land filling site	A competent environmental consulting firm	Monthly	Already covered in the soil monitoring
Noise emission and Vibration					
Noise emission and vibration risk from unloading construction materials, earth works, foundation pile driving operation,	- These operations will be limited to mid-day working hours. - Noise barriers will be erected to suppress the noise level. - No unloading will be permitted at late night. - Careful and proper unloading arrangements will be applied. - All earthwork activities will be carried out behind the cover of noise barriers. - Careful management will be applied to reduce noise and vibration. - Latest silent foundation-pile driving methods will be applied. - Pile driving activities will be arranged in normal working hours and behind sound barriers.	Day and nighttime noise emission level should not exceed 70dBA for Industrial and commercial area. Vibration risk should not exceed 2.5 to 10 mm/s for construction period earth working and piling in non-sensitive commercial area.	A competent environmental consulting firm	Monthly monitoring on noise level with NEQEG limit. Frequent checking and careful supervising on noise emission activities and vibration risk. Record keeping.	500

	- Vibration will be monitored not to exceed the acceptable threshold.				
Noise emission from movements of heavy vehicles, construction activities construction crew, and backup generators	- Trip management will be strictly applied to safe fuel and to achieve efficiency at the same time, to minimize the noise and vibration levels. - Regular maintenance will be required to maintain smooth operation of vehicles and not to generate excessive noise and vibration. - In addition, heavy vehicles will be operated in daytime only. - The peripheral will be covered with sound barriers for the noise emission activities. - Construction activities will be carried out behind the cover of sound barrier screens. - Crews will be educated to lower noise level to the best possible extent.	Day and night time noise emission level should not exceed 70dBA for Industrial and commercial area.	A competent consulting firm	Regular monitoring on trip management and vehicles maintenance practices. Monthly monitoring on construction activities and noise safety of construction crew. Record keeping for environ-mental auditing.	Already covered in noise and vibration monitoring
Solid waste generation					
Solid wastes and construction spoils from construction activities Shipping materials	- Construction debris and discarded materials will be stored properly and sold for reuse. - All by-product materials will be recycled and sold. - Non-reusable debris and concrete pieces will be discarded to designated area.	Reusable and non-reusable debris	Main contractor and its sub-contractors	Monthly	Management cost in the construction

Domestic waste generation from construction workers and management crews	- Wastes will be kept properly in trash bins. - These wastes will be separated, and wet wastes will be collected regularly by nearby municipal department while the recycle materials will be sold. - Sufficient trash bins will be placed throughout the project's construction area.	Waste segregation practices and trash bins and collection frequency and volume of waste per month	Main contractor and its sub-contractors	Monthly, Record keeping for estimated volume of domestic solid waste generated from the whole construction period.	A portion of construction cost
Social and Occupational health and safety impact					
Social adverse effects by tension and conflicts between migrant workers and local communities	- Local hire is encouraged, and contractors are asked to include local hires. - Contractors' experienced workers are confined in worker camps. - Cross visit is allowed but time restriction is imposed. - The contractors are to reach out to communities to listen their concerns and find solutions. - Any social conflict with local communities should be reported immediately and prompt attention to settle the conflict would be developed.	Total number of local laborers and migrant laborers Gender ratio	Main contractor and its sub-contractors	Monthly Record keeping for environmental review and auditing.	A portion of construction cost.
Discrimination, gender inequality, compliance with labor regulations, refusal for workers with disabilities,	- DOB is an equal opportunity employer and therefore, encourages peoples with disabilities to work relevant to their skills. - Lower rate based on gender is strictly prohibited and the project takes seriously	Working hours Leave and holiday Pay rates for different genders, Worker rights	Main contractor and its sub-contractors	Monthly	A portion of construction management cost

disregards to overtime compensation	that women are entitled to equal pay rate with men in the same job function. - In compliance to Myanmar Government's labor rules, overtime compensation should be defined in accordance with the national regulations.	Pay scale and basic salary Overtime rate per hours			
Job competition between local and migrant workers	- Prioritize local laborers as both daily workers and managerial levels if they have equal qualification - Provide training to local youth for required skills - Communicate with local or village administrative authorities for local labor recruitment opportunities - Equal pay scale for both local and migrant workers	Local and migrant ratio Skill requirement Labor registration Pay scale	Main contractor and its sub-contractors	Monthly	To be included in construction cost.
Land dispute, involuntary resettlement, and disadvantageous to minority ethnic communities	- Acquired land legally - Consult with land owners until final agreement has been reached. - Provision of proper resettlement or compensation plan - Prior clarification and agreement between land owners and developer - Minority ethnic groups are consulted early - Adopting the protection of ethnic minority rights	Land acquisition documents Any complaint during construction period Resettlement action plan Evidence of consulting ethnic minority groups and	The project management	Semiannually	A portion of land acquisition cost

		Placing of ethnic minority management plans			
Safety, risks, and health hazards from refusal to use PPE, work related injuries, sickness, and fire incident	- PPE requirements are to be met at all cost in work zone. - Anyone without sufficient PPE will not be permitted to work and there is no exception. - Regular health and safety training will be offered. - Strict enforcement of these policies will be applied, and close monitoring will be executed daily. - Any work-related incident will be reported promptly, and the injured worker will be provided immediate medical attention at an appropriate medical facility. - Health services will be offered for the employees. - Sick leaves will be granted given that medical certificate be presented afterward. - Emergency drills will be carried out and everyone will be informed of safe assembly points, head counts responsibility, and immediate contact with the closet fire department.	Personal protection equipment Work permit Certificate for some risky and chemical related works, Social welfare, Insurance, First aid kit, Health care services Firefighting equipment Annual recertification	Main contractor and its sub-contractors	Monthly	A portion of construction management cost

8.3 Environmental and Social Management Plan for Operation phase of the New Bridge Project

Potential Adverse Effects	**Measures adopted**	**Monitoring indicators**	**Responsible Party**	**Implementation schedule**	**Budget Allocated**
Pollution and waste generation from occasional maintenance					
Pollution from the use of equipment and crew Maintenance activities	- Improve custom and inspection system - Regular monitoring and evaluation - Reduce the cause of delays and blockages	Complaints of interruptions with increased traffic Level of pollutant increases	A competent environmental consultant	Bi-annually	500
Waste generation From maintenance activities and spoils	- Proper management of wastes generated - Systematic approach to waste handling to waste management - Construction spoils can be reused in land reclamation	Volume of wastes Level of spoils	A competent environmental firm	Bi-annually	500
Traffic interference					
Disruption to traffic Blockage and delay leading to traffic congestion locally	- Improvise improvements and efficiency in the inspection systems - Study traffic flows and improvement in management of traffic flows - Implement modern traffic controls and diversion in time of maintenance	Traffic counts and flow patterns Time lapse for inspection	Competent consulting fund	Quarterly monitoring	500

Occupational health and safety					
Work related injury and accidents, dangerous working environment	- Requirement for regular safety training - Provision of proper protective gear and materials - Strict safety procedures for any maintenance operations - Good communication system and clear coordination for maintenance operations - Regular examinations, reviews, and reevaluations for existing system improvements	-Document of number of work-related accidents - Workers' clear understanding of hazards and procedures -Regular employment of all protective gears	Competent environmental consulting firm	Quarterly	500
Incidents and emergency cases from operation and maintenance	- Ensure toolbox meeting in every workday morning before commencement of work - Provision of first aid kit and CPR training if possible, - Provide health care service or clinic. - Training program for firefighting, flash flood and earthquake events are encouraged.	Training programs First aid kit Clinic Notice board Responsible team List of hospitals	Competent environmental and safety consulting firm	Semi-annually	Included in the fee for consulting firm
Potential Hazards during the time of natural and man-made hazards					
Floods Forest fires Accidents Earthquake	- Placement of proper procedures to respond to all potential dangers - Familiarity and training for rapid response mechanisms - Drills for all schemes - Clear and precise communication and warning systems for workers and communities - Provision of trainings - Emergency safety shut down programs	Documents of disasters and hazards Reporting of accidents	Competent environmental consulting firm	semiannually,	500

8.4 Environmental and Social Management Plan for Decommissioning, closure and post closure phases for the Project

Potential Adverse Effects	Measures adopted	Monitoring parameter	Responsible Party	Monitoring Frequency	Budget Allocated
Solid wastes and scrap metals					
Solid wastes disposal from demolition debris and ruins, Scrap metals	- Demolition debris and ruins of the building will be recycled - Recycle solid wastes from demolition process and dispose at a designated area - Scrap metals will be recycled, - Systematic transportation of solid wastes	Waste types and management measures Collecting frequency	The project management	Monitoring along the demolishing process until final disposal site to ensure that not to disturb nearby environment	US $2000
Impact on Air Quality					
Demolishing of buildings and infrastructures and transportation of demolished wastes and debris	- Provide proper notification prior to demolition. - Strictly avoid the free open burning of solid waste materials at the project site. - Apply dust control by placing screen covers and barriers along the site. - Spray dust control substances and water regularly before the process	Demolition debris, waste types Exposed surface	The project manager	Weekly Throughout the decommissioning-phase.	-
Impact on Noise and Vibration					
Noise and Vibration due to the operation of demolishing activities working	- Ensure that machines and equipment are properly maintained for minimum generation of noise and vibration.	Type of machines and equipment, to be used, and type of wastes and debris to be handled.	The project manager	Weekly	-

Potential Adverse Effects	Measures adopted	Monitoring parameter	Responsible Party	Monitoring Frequency	Budget Allocated
with heavy machinery and equipment.	- Use of noise and exhaust control devices for combustion engines. - Prepare well planned schedules by consulting local communities prior to demolition. - The project proponent must take a responsibility to comply with the relevant legislation regarding noise and vibration standards	Type of noise, vibration, and exhaust control devices to be used.		Throughout the decommissioning-phase.	
Occupational Health and safety					
Health and safety issues caused by demolition of the infrastructures,	- Hire certified contractor with trained workers to avoid risk and accidents - Obligatory use of relevant personal protection equipment - Ensure complete understanding and acquaintance to ESMP prior to the commencement of demolition process - Firmly secure, tie down, and cover equipment and vehicles in transportation - Hire experienced and licensed drivers for transportation of materials and demolished subjects - Ensure full compliance to local traffic rules and regulations	Contractor's track records and experience Contractor's accident reports, records, and training offered Drivers' competency, Driving habits, licenses, and checklist	The project manager	Weekly monitoring until the end of decommission	-

Potential Adverse Effects	Measures adopted	Monitoring parameter	Responsible Party	Monitoring Frequency	Budget Allocated
	- Inform local communities of the activities				
Unemployment					
Loss of jobs and unemployment	- Inform all employees of the plan at least 6 months ahead of the process - Compensate in accordance with Myanmar legal requirements for those who choose not to seek transfer of jobs - Offer help and assistant programs for other job opportunities - Create employment opportunity networks so that those who loss jobs will have easier opportunities to seek other jobs	Documenting unemployment situation Prior counselling and statistics Employment opportunities network Meeting with other potential employees	The project manager	Monthly throughout the decommissioning phase	-

9.0 RESETTLEMENT ACTION PLAN (RAP)

While legal requirements in Myanmar do not require to the level of resettlement action plan (RAP) and ethnic minority management plan (EMMP), the proposed new bridge project that is going to be established in rural agricultural setting with different ethnic minorities, namely, Wa, Kachin, ethnic Chinese, and very few number of Shan and Myanmar, will adopt RAP and EMMP to ensure fair treatments and to protect the ethnic minorities.

This section will articulate and define RAP and EMMP of the project. Most of the plausible effects of this project are expected to be small in scale, site specific, and short lived. No residual significant adverse impact is envisaged to occur to trigger RAP and EMMP of the project but nevertheless, the project proponent, DOB, wishes to include these safeguards instruments in the project planning. While Myanmar's legal requirements for RAP and EMPP are still underdevelopment, DOB will ensure adherence to the commitments in RAP and EMPP.

DOB's Resettlement Action Plan (RAP)

RAP aims to avoid resettlement where feasible or minimized by exploring all viable alternative designs. Where resettlement is not feasible to avoid, it should be executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits. Displaced persons should be meaningfully consulted and should have opportunities to participate in planning and implementing resettlement programs. If physical relocation of a few peoples less than 200, abbreviated RAP will be initiated while the resettlement of more than 200 peoples will trigger a full-blown RAP. The project will be responsible for the preparation and implementation of safeguards instruments including Environmental Codes of Practice (ECOP), ESMP, voluntary donation forms, abbreviated RAP or full RAP, as applicable, according to DOB policies and procedures. DOB will ensure that no physical land acquisition or resettlement of affected people commences before an abbreviated RAP or RAP has been implemented, or before the voluntary donation form is signed by the affected household(s) and reviewed and approved by the higher authority in DOB. In accordance with RAP, project activities comply with the relevant national regulations.

Myanmar Land Laws:

Farmland Law was adopted in March 2012. It affirms that the state is the ultimate owner of all land. It also provides a private use right over farmland that includes the right to sell, exchange, inherit, donate, lease and 'pawn' the land. The Farmland Law also covers conditions under which farmers can retain use-rights, the state's power to rescind such rights, the process for settling land-related disputes, and basic requirements for compensation in the case the state acquires the land for public purposes.

The Vacant, Fallow and Virgin Lands Management Law was also enacted in 2012. It governs the allocation and use of virgin land and vacant or fallow land. This law provides establishment of the Central Committee for the Management of Vacant, Fallow and Virgin Lands (CCVFV), which is responsible for granting use rights for such lands.

The 1894 Land Acquisition Act remains the primary law governing compulsory

land acquisition. The Act permits the government to acquire land for public purposes and requires it to compensate land users. Its provisions include the procedures for required notice for acquisition of land and objections or appeals, as well as land valuation methods. However, this law has been outdated and could not be applied to complex issues in the contemporary setting. Therefore, Myanmar Government stipulated new land acquisition law on August 19, 2019.

The new land acquisition law in August 2019, requires any state agency to disseminate adequate information to affected land owners and to carry out public consultations, to pay current land price regardless of the ownership documentation, to pay specific fees for the crops and long term plants, to provide assistance to the property owners for the relocation and restarting their business, and to pay for all the cost in the compensation process. Any permanent or temporary land acquisition has to conform with the new law for any state or government project.

RAP deals with potential impacts and mechanisms to negate the adverse impacts, valuation and compensation for losses at replacement cost, programs for restoration of livelihoods and standards of living, consultation and participation arrangements in the compensation processes, and implementation schedule in combination with grievance procedures, monitoring, and evaluation of the process. Full-fledged RAP will require the resettlement of over 200 peoples. When the abbreviated RAP is triggered with the need for resettlements for less than 200 cases, the abbreviated RAP will include the following, at minimum:

(a) a census survey of displaced persons and valuation of assets;

(b) description of compensation and other means of resettlement assistance to be provided;

(c) consultations with displaced people about acceptable alternatives;

(d) institutional responsibility for implementation and procedures for grievance redress;

(e) arrangements for monitoring and implementation; and

(f) a timetable and budget.

The RAP will describe measures taken to consult with displaced persons regarding proposed land acquisition and other arrangements and summarize the results of the prior informed and consenting consultations. DOB ensures public disclosure of the RAP to the general public in the project area, in a language and location accessible and understandable to them. Prior informed and consenting consultations and disclosure of the RAP will be properly and adequately documented. All consultations will be conducted in a local language and sufficient lead time (minimum 2 weeks) will be given to ensure that all affected people and stakeholders are able to participate in consultations and be fully informed of the project as well as the project safeguard approach.

All persons displaced economically and / or physically are entitled to compensation at replacement value for land and lost assets. Valuations must be undertaken in accordance with fair and transparent valuation standards. Being in the state of squatters or those living on or using land without proper land title or a lack of legal land transcripts will not bar displaced persons from entitlement to fair compensation or alternative forms of assistance needed to relocate and sustainably restore incomes. Compensation rates as established in RAP should be paid in full to the eligible owner or user of the lost asset, without depreciation or deductions for

any purpose. DOB will ensure that the compensation for land, standing crops, and lost assets will be paid prior to the time of impact.

Land to be used temporarily must be acquired in consultation with landowners or land users and appropriate market compensation will be paid for any standing crops. An allowance should be paid to land users for inconvenience and a negotiated rental fee should be paid to the landowners. All land used temporarily will be restored to its previous condition. Displaced persons should be consulted during the process of RAP preparation, so that their preferences regarding land acquisition and compensation arrangements are solicited and considered. Based on the result of census and social impact assessment, DOB's RAP will provide measures to help affected people at least restore the pre-project level of livelihood.

Voluntary land donation will be allowed. Community members who benefit from a sub-project may donate land or other private assets to the sub-project voluntarily and without compensation. Voluntary donation is an act of informed consent and affected people must not be forced to donate land through coercion or under duress or be misled to believe they are obliged to do so. Any form of coercion will not be tolerated in the voluntary donation process. Relevant authorities from DOB will oversee and ensure that the proper voluntary land donations process is followed and appropriately implemented. DOB will be responsible for monitoring the processes used by assigned team.

The Project will incorporate a strong system of monitoring and evaluation (M&E) to:

(a) ensure effective and timely implementation according to plan and apply mid-course corrections where needed;

(b) measure the achievement of results envisaged in its objectives and learn lessons for future operations; and

(c) ensure implementation of the requirements of DOB's safeguard policies.

Methods by which displaced persons can pursue grievances will be established and information regarding these grievance procedures will be provided to displaced persons. Grievances are cost-free and easily accessible to project-affected people.

9.1 Ethnic Minority Management Plan (EMMP)

In addition to RAP, the project will also conform to EMMP. No negative impact is expected to occur to ethnic minorities under this project implementation program.

The Ethnic Minority Management Plan (EMMP) is prepared to ensure that (i) ethnic screening would be conducted; (ii) that, if ethnic minorities are found to be present in or have collective attachment to project areas, free, prior and informed consultations will be conducted leading to the broad community support to the project, and (iii) that Social Assessment would be conducted and Ethnic Minority Management Plan (EMMP) will be developed to identify, asses, minimize and mitigate negative impact that may fall on local ethnic groups. The ethnic minority management framework describes principles, processes and procedures for assessing potential impacts and preparing EMP in line with Myanmar Government's Policies.

This EMMP aims to provide DOB with the operational planning framework to avoid adverse social impacts and provide equitable and culturally appropriate project benefits to

local ethnic minority communities and other vulnerable population groups. The EMMP has been developed to address the social safeguards aspects of ethnic minorities in the context of Myanmar.

Legal framework with regard to ethnic minorities:

According to Chapter 1, clause 22 of the 2008 Constitution of Myanmar, the Union Government of Myanmar is committed to assisting in developing and improving the education, health, language, literature, arts, and culture of Myanmar's "national races." It is stated, that the "Union shall assist:

(a) To develop language, literature, fine arts and culture of the National races;
(b) To promote solidarity, mutual amity and respect and mutual assistance among the National races; and
(c) To promote socio-economic development including education, health, economy, transport and communication, [and] so forth, of less-developed National races."

The Myanmar constitution provides equal rights to various ethnic groups included in the national races and a number of laws and regulations aim to preserve their cultures and traditions. This includes the establishment of the University for the Development of the National Races of the Union which was promulgated in 1991 to, among other things, preserve and understand the culture, customs and traditions of the national races of the Union, and strengthen the Union spirit in the national races of the Union while residing in a friendly atmosphere and pursuing education at the University.

There is no central government agency with the responsibility for addressing particular issues pertaining to ethnic minorities. The vast majority of Myanmar's ethnic minorities live in the seven States and these are in most cases led by the main ethnic minority in the respective States. In relation to previous ceasefire agreements, ethnic minority groups were granted authority over political and economic affairs in their areas, covering large areas of the States. Social and other public services were developed by ethnic authorities, often with support from NGOs, and are still operating in many areas.

With commitments in the EMMP, DOB will conduct social screening and impact assessments in the project area to identify the presence of ethnic minorities. The ethnic minorities, if found, will be provided prior informed and consent public consultations in the languages that they understand. Their voices will be echoed in the project's planning and implementation.

As multiple ethnic minority communities are found to be present in project affected areas, free, prior and informed consultations will be conducted in a participatory manner to ascertain broad community support. EMMP in conjunction with social assessment will minimize and mitigate negative impacts that may fall on local ethnic groups. Based on social assessment and free, prior, and informed consultation with ethnic communities, adverse impacts will be identified, and mitigation measures will be adopted to address potential adverse impacts of the project on the ethnic minorities.

9.2 Grievance Redressing Mechanism (GRM)

DOB ensures that complaints and issues raised by workers and local people and communities will be registered and dealt with appropriately in a timely manner. The project's GRM is intended to receive complaints and issues and to help communities and workers find

solutions for their concerns. 1st responsible persons for GRM will be designated staffs from the project's local office but their work on GRM will be overseen by a designated staff from DOB. DOB will deploy two designated staffs as second tier responsible persons for GRM.

As soon as GRM receives a concern or complaint, it will initiate investigation of the causes and will seek solutions together with the stakeholders within 15 working days. Any decision made for the specific case will be informed to the communities and DOB. Cases involving damages to private properties will be referred to the project's management for initiating compensation process and the persons of concern will be informed regularly of the development with the case. Transparency and fairness of every step involved will be assured in the GRM. If the case cannot be resolved within that time limit, it should be referred to the second tire gradually and the stakeholders should be informed and advised. All complaints and solution will be made publicly available.

The phone numbers and communication methods will be identified to make it easier for the communities to file complaints and report suggestions. Each report will be documented, and the actions taken will also be recorded and published. Follow up actions will be carried out to evaluate solutions and the status of the case. Signboards depicting contact numbers and other ways to report will be put in place prior to the commencement of the project.

Communities will be consulted about the GRM and informed about its function and about ways to report GRM. The functions and roles of GRM will be explained and the information materials will be made readily available in community centers and in relevant local administrative offices.

10. PRIOR INFORMED AND CONSENT PUBLIC CONSULTATION AND DISCLOSURE

10.1 Methodology and Approach

As a crucial instrument of the project's social assessment tools, a series of public consultations was conducted in line with the requirements from the EIA guidelines. Emphasis was set on prior informed consent nature of participatory public consultations in conformity with MOC's policy to meet ECD's requirements. Every possible effort was made to meet the prerequisites for prior informed and consent process in the conduct for public consultations. In order to grasp the general livelihood conditions of the affected communities and surrounding areas, socio-economic surveys were conducted in October 2019.

The survey findings are incorporated in the earlier section, Socio-Economic Components, of this report. The current population of Kunglon Township is 57,501 with 5,837 people in township area, and 51,664 people in the rural areas. Overwhelming majority of Kunglon residents are Koe Kant while the rest constitutes Kachin, Wa (Lwae La), Myaung Zee, Shan, Burmese, and the others. Holi Village tract with 320 households hosts the population of 2,000, whereas Khaik Pan Village of Holi village tract with 18 households has the population of 80. Tadar Oo village has reportedly 120 households while Ton Kyat village with 270 households has the total population of 1653. Majority of people in Holi and Khaik Pan village is Christian while Buddhist are majorly distributed in Ton Kyat and Tadar Oo. There is one Church Building in Holi Village and Tone Kyat. In Holi Village Tract, a high school and a primary school are in place but there is no school in Khaik Pan Village. A primary school each was found in Tadar Oo village and Tone Kyat village. Majority of the households in four villages, earn between 100,000 and 400,000 Kyats per month. Electricity is available in Holi village, Tadar Oo village, and Tone Kyat village, however, some are using power from battery and solar energy. But there is not electricity available at Khaik Pan Village. Creek serves as major water source in four villages and some use spring water and water from tube wells.

To perform participatory public consultations, the residents around the new bridge site and the peoples around the existing bridge, and the peoples along the approach road involving four villages all in all namely Holi village, Khaik Pan village, Tadar Oo village and Tone Kyat village in Kunglon Township that fall into the project affected area have been included in the public consultations. All The villages and related sub-groups were informed of the project and the planned public consultations nearly a week prior to the events. Follow-up to check the awareness of the public consultations in villages was carried out and message of encouragement to attend the meeting was conveyed at the same time by phone to several villagers in each village. Invitations to the other stakeholders were also carried out in person. Emphasizing the ease to attend the public consultations, public consultations were planned in Holi village and Tone Kyat village near Kunglon.

The first public consultation meeting at Holi Village took place between 9 to 11 AM on 2nd October 2019 and totally, 62 participants took part in the cordial and frank discussions. Because of the security concerns and prior commitments, the representative from DOB could

not attend the public consultations. Subsequent public consultation in Ton Kyat Village was held between 12:30 and 2:30 PM and total of 72 attendees participated in the consultation meeting. Despite the absence of the representative from DOB, officers from Department of Road administered the event. Facilitation and documentation were performed by the consultant team. Specifically, the participants raised all the questions related to their concerns and potential social impacts they have imagined to receive and these questions and answers were recorded.

At the date of 14th December, 2019, the second public consultation meeting at Holi village took place between 1 pm to 3 pm and 62 villagers participated in the meeting while two representatives from Bridge department, one representative from road department, 6 delegates from Township's Security, Security Police (SP), and Oriental Highway Company (OHC) also attended in the meeting. Afterwards, subsequent public consultation in Ton Kyat village was held from 3:30 pm to 5 pm in the same day. Total of 31 villagers attended to the consultation meeting while 10 representatives from bridge department, road department, administrative department, Township's security, village administrative office, SP and OHC participated in the meeting.

The atmospheres in both public consultation events were filled with friendly exchanges of questions and answers and productive remarks. The summary of the discussions is described in the following section.

10.2 Summary of Discussions in the Consultations

(a) First Public Consultations

Discussion in Holi Village with the participants from Holi Village, Ta-Dar-Oo Village, and Kaik Pan Village centered mainly on the land acquisition issues and economic effects of the project implementation. The villagers demanded the methods and valuation that the project will apply in the land acquisition process and the rate determination for the rubber plants. The villagers urged fair, equal, and transparent compensations right to the property owners directly. The peoples in Holi Village expressed their worries over traffic congestion, blockade, and traffic related safety issues as well. Negotiations for compensation have been initiated in line with the government's compensation requirements but it seemed that some peoples' properties have been missed out in the process. Those will be addressed in the next round of negotiation, one of the negotiation representatives said. The compensation process should be clear, fair, and transparent and documentations from every step of the processes should be recorded. Unrelated to the event, the villagers were very concerned with the future road widening that could see the removal of many homes in Holi Village.

The peoples from Ta-Dar-Oo Village brought up direct economic impacts on the residents. They were worried with the closure of the old bridge. The villagers urged necessary rehabilitation to the existing bridge and continuous use of the bridge for the local communities. If they have to use the new bridge, that would create obstacles to their daily routines as it would be farther from the existing bridge. The villagers reminded that the existing bridge is historically important and therefore, it should be kept and maintained to be in a good condition. Further discussions with DOB are needed to address their concerns and these matters will be

discussed in the next public consultations. The communities from Kaik Pan Village were worried that some of their community forests could be destroyed by the construction workers. Environmental and Social Management Plan (ESMP) will include measure to address all these concerns. The villagers requested to seek prior agreements if the project has to use those community forests. Participants from all villages showed excitement with possible job opportunities for their villagers in the project implementation.

The villagers from Khaik Pan Village hoped that the development project should extend linkage to their village by improving road access and bringing electrical power supply to the isolated village. Any form of road improvement will be a major win to secure their hearts and minds from the village.

Afternoon public consultation at Tone Kyat echoed the issues of the discussions from the morning section. In addition to the compensation method, rate, and payment method, the participants in the afternoon section raised question about the right to use the remaining land along the project area. Issues related to burial places and places with religious importance were raised in the discussion. The villagers requested proper relocation with their prior approval if one of these places fall in the construction zone. In accordance with the Ministry of Construction's policy, if any of these places fall in the area demarcated for the implementation work, proper negotiation will be taken place to obtain permission and agreement prior to the relocation of the site. The villagers requested early negotiation for land acquisition and also demanded for transparent transition of fund in the compensation process. Similar to the other discussion earlier that day, the villagers deemed that employment opportunities should be prioritized for the local workers. The villagers brought up concerns for community safety and traffic safety.

(b) Second Public Consultation

The second public consultations for Kunglon Bridge Project was conducted in Holy Village and Ton Kyat Village in Kunglon Township, Shan State on the date of 14 December 2019. In both locations of the public consultations, issues related to compensation for land acquisition, the rate of compensation, substitution for the land, job opportunities in the implementation work, concerns with the future expansion of road after the bridge, and access road for a remote village, which would see loss of its farm lands were raised by the participants from all villages in the affected area and the project side provided answers to the concerns.

Majority of discussions centered on the land acquisition questions. Some members of the communities raised the concern over the timeline of the compensation insisting that compensation should be carried out first prior to the construction. The project team responded that the compensation will be the first in the plan and in fact, it would be approximately within a few weeks after the public consultation.

Because of the scarcity of vacant land in the area, a few participants brought up the possibility of providing land substitute in lieu of the land acquired for the project. The project responded that any property taken away for the project will be compensated. Those, from whom lands have been seized for the project, will be given first priority in the distribution of

the plots in the new town project, which has been in development. The project gave the assurance that the property owners can work on their remaining lands.

Many participants brought up the questions related to the rate of compensation in the consultations. Understanding that the rate of compensation is a delicate and sensitive issue to handle, the project team answered that in determining the compensation rate, the project will work together with local land committees, which include local administrative bodies from related communities and regional representatives. Based on transparency and fairness, the compensation rates will be determined while the representatives of the communities will be consulted.

In response to the request for assistance to improve access road for a few remote villages, the project replied that other departments in the Ministry of Construction have been gradually increasing rural road developments and therefore, the access road would see the gradual improvement soon. In addition, it takes time to settle the strength of the dirt road first prior to other stages of road improvements, the project team added. For the job opportunities, the project will ensure to create job opportunities for the local communities at its best, the project responded.

10.3 Recommendations out of consultation findings

The project's future public consultation programs need to address the following matters:

- The bridge design, road alignment, and how the construction will be implemented should be presented to the communities. Potentially affected persons or communities should be informed clearly, and discussions should be executed in transparent manner to quell misunderstanding and rumors.
- Compensation committee should be introduced publicly, and the committee is required to keep in touch with all affected persons and to prevent missing out of affected peoples. The committee should promote transparent compensation process to the peoples in the area. Other economically affected communities need to be discussed candidly how the project and minimize the adverse impacts and how the project management can find ways to develop opportunities for the communities.
- Networks should be established with the communities to make arrangement and preparation for potential employment programs for the local communities and for requirements in safe working practices.
- Introduction to Grievance Redress Mechanism (GRM) should be educated to the peoples to get acquainted with the process and to enhance public relation for the project.
- The project has to explore possibilities to extend its development programs to the nearby communities so that they don't get left out in the project.
- The peoples should be informed regularly of the project's development and stages of implementation.
- DOB has to represent itself with some officers who are good and committed to do better for the public.

Physical Cultural Resources – Chance Find Procedure

DOB is determined to preserve historical and physical cultural resources and therefore, any incident of chance find historical and physical cultural resources will follow Myanmar's chance find procedure accordingly. When a chance find artifact with physical cultural importance is discovered, it will trigger the chance find procedure for physical cultural resources.

When an artifact with importance to historical or physical cultural resources is found, the entire area will be sealed off to prevent further disturbance and ongoing work will be put to a halt. National archaeological and cultural authorities will be immediately invited to carry out necessary investigation. Until the clearance is instructed by the relevant authority, the project will not assume the work and it will report the development to the counterparts.

The project will commence the operation only after clearance is granted by the relevant authorities. If the discovery of chance find is significant, the relevant authorities will be reported and discussed to find alternative solutions. Special attention and care will be instructed to all teams working near plausible sites and near ancient cities, historical sites, and pagodas. The project's chief engineers for the respective field will coordinate activities for such places.

Monitoring and Reporting Procedure

While awarded contractors and sub-contractors will be responsible for day to day monitoring, the project will take charge of regular monitoring and inspection. Check list and specification for regular monitoring programs will be developed and the project's local team will be trained for monitoring and inspection of the work. The project local team will carry out weekly monitoring requirements using the check list and with the supervision of the regional level; it will take corrective actions for any infringement. The finding will be reported to the project management and DOB. More experienced and trained team will carry out thorough inspection and monitoring as specified in the ESMP. In addition, a reliable environmental firm will be contracted to carry out environmental quality monitoring for ambient air quality, noise and vibration, soil, and water quality. Results of monthly findings will be reported to DOB, ECD, and the relevant parties and corrective actions will be developed as required based on the conclusion of the findings. The project's management will be responsible for issuance of report for monthly environmental and social monitoring and project's progress.

Undertaking by the Project Proponent

The project is committed to meet requirements set by Myanmar ECD. The project will implement every step mentioned in the ESMP and fulfill the project's environmental and social commitments for betterment of the communities and localities it operates. The project will file annual reports to ECD for its ESMP developments and monitoring.

By signing underneath and submitting this report, the project undertakes responsibilities to comply and meet all these stated operations and procedures. The project makes the assurance that everyone working under the supervision of the project will adhere to stated commitments described in the ESMP. The project will religiously follow the monitoring schedule set in the ESMP and document the results to report to ECD and relevant authorities.

The project will strive to achieve prevention of environmental and social impacts together with the cooperation and guidance from the ECD. In addition, the project provides assurance that necessary modification and updates will be carried out when new unexpected issues emerge. All these issues will be dealt with adequately.

Signature of the director

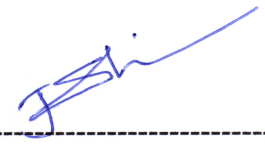
Name: ----------

Designation: ----------

Date: ----------

Undertaking by the Consultant

By signing this report, the consultant acknowledges that the assessment, the report, and ESMP are developed in truthful manner to the best of the consultant's knowledge. The consultants have exhausted their best possible capacity to form complete environmental and social guidelines for the operation of this particular project.



Signature of the key consultant

Name: Josiah Bowles

Designation: Senior Field Specialist

Date: 8.5.2020

11.0 ANNEXES

11.1 Photolog for Air and Noise Monitoring (First season survey)

Air and Noise Monitoring Location (KLA3)

Air and Noise Monitoring Location (KLA2)

Air and Noise Monitoring Location (KLA4)

Air and Noise Monitoring Location (KLA1)

11.2 Photolog for Air and Noise Monitoring (Second season survey)

L) Air and Noise Monitoring

Air and noise location (KL2)

Air and noise location (KL3)

Air and noise location (KL4)

11.3 *W*ater colour for each sampling point

Photo 1 - KLB- 1

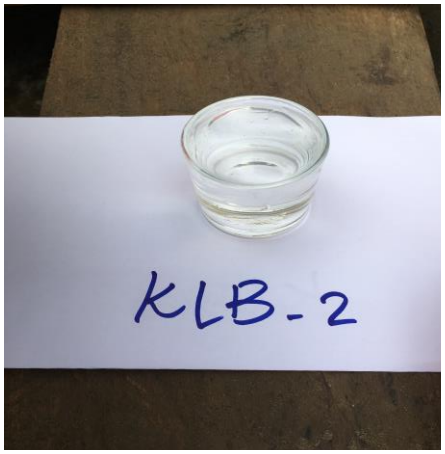


Photo 2- KLB-2

Photo 3 -KLB-3

Photo 4 -KLB

11.4 Photolog for Water sample collection photos

Onsite water sample collection

Onsite water sample collection

11.5 Photolog for 1st Public Consultation Meeting

11.6 Record Photos for 2nd Public Consultation Meeting

2nd PCM at Holi Village

Discussion by the participant

Record Photo for the attendance list

Record Photo for the attendance List

2nd PCM at Ton Kyat Village

2nd PCM at Ton Kyat Village

Record for taking attendance list for 2nd PCM at Ton Kyat Village

Record for taking attendance List for 2nd PCM at Ton Kyat Village

11.7 Photolog **for Social Survey Assessments**

11.8 Attendant list for 1st Public Consultation Meeting

Lists of Attendee 1st Public Consultation at Holi village

ရှမ်းပြည်နယ်မြောက်ပိုင်းကွမ်လုံမြို့အနီးသံလွင်မြစ်ကိုဖြတ်သန်းတည်ဆောက်မည့်ကွမ်လုံတံတားတည်ဆောက်ရေးလုပ်ငန်း
စဉ်အားအများပြည်သူများနှင့်တိုင်ပင်ဆွေးနွေးခြင်း (EIA Public Consultation Meeting) သို့တက်ရောက်လာသူများစာရင်း

နေ့စွဲ ၃. 10. 2019

	အမည်	မြို့နယ်	ကျေးရွာအုပ်စု	ကျေးရွာ	လက်မှတ်
၁။	ဦး [illegible]	ကွမ်းလုံမြို့	[illegible]	[illegible]	
၂။	ဦး ဒေါင်ဂေါင်	"	ဟိုလိ / ခိုင်ယုံ	[illegible]	
၃။	ဦး ခိုင်ဂေါင်	"	ဟိုလိ	ဟိုလိ ([illegible])	
၄။	ဦး ယောင်းဂေါ	"	"	ဟိုလိ (Pastor)	
၅။	ဦး ဂေါ်ယောင်း	"	"	ဟိုလိ	
၆။	ဦး ဒေါင်ဂေါင်	"	"	ခိုင်ယုံ	
၇။	ဦး ဂေါင်ချောင်	"	"	ဟိုလိ	
၈။	ဦး မိုးမြင့်	"	"	"	
၉။	ဦး ရှန်းအောင်	"	"	"	
၁၀။	ဦး [illegible]	"	"	"	
၁၁။	ဦး [illegible]	"	"	"	
၁၂။	ဦး [illegible]	"	"	"	
၁၃။	ဦး [illegible]	"	"	"	
၁၄။	ဦး ကျော်သူအောင်	"	"	"	
၁၅။	~~ဦး အောင်စိုး~~	~~"~~	~~"~~	~~[illegible]~~	
၁၆။	ဦး ဒေါင်ကျား	"	"		

Lists of Attendee for 1st Public Consultation at Holi village

ရှမ်းပြည်နယ်မြောက်ပိုင်းကွမ်းလုံမြို့အနီးသံလွင်မြစ်ကိုဖြတ်သန်းတည်ဆောက်မည့်ကွမ်းလုံတံတားတည်ဆောက်ရေးလုပ်ငန်း စဉ်အားအများပြည်သူများနှင့်တိုင်ပင်ဆွေးနွေးခြင်း (EIA Public Consultation Meeting) သို့တက်ရောက်လာသူများစာရင်း

နေ့စွဲ 2.10.2019

	အမည်	မြို့နယ်	ကျေးရွာအုပ်စု	ကျေးရွာ	လက်မှတ်
17	[illegible]	ကွမ်းလုံ	ဟိုလီ	ဟိုလီ	[signature]
18	[illegible]	〃	〃	〃	[signature]
19	[illegible]	〃	〃	〃	[signature]
20	[illegible]	〃	〃	〃	[signature]
21	[illegible]	〃	〃	〃	[signature]
22	[illegible]	〃	〃	〃	[signature]
23	[illegible]	〃	〃	〃	[signature]
24	[illegible]	〃	〃	〃	[signature]
25	[illegible]	〃	〃	〃	[signature]
26	[illegible]	〃	〃	〃	[signature]
27	[illegible]	〃	〃	〃	[signature]
28	[illegible]	〃	〃	〃	[signature]
29	[illegible]	〃	〃	〃	[signature]
30	[illegible]	〃	〃	[illegible]	[signature]
31	[illegible]	〃	〃	[illegible]	[signature]
32	[illegible]	〃	〃	ဟိုလီ	[signature]

Lists of Attendee for 1st Public Consultation at Holi village

ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ကွမ်လုံမြို့အနီးသံလွင်မြစ်ကိုဖြတ်သန်းတည်ဆောက်မည့်ကွမ်လုံတံတားတည်ဆောက်ရေးလုပ်ငန်း
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နေ့စွဲ ......2.10.2019........

	အမည်	မြို့နယ်	ကျေးရွာအုပ်စု	ကျေးရွာ	လက်မှတ်
33	ဦး အောင်ကျော်[illegible]	ကွမ်းလုံ	ဟိုလီ	နိုင်ပန်	[signature]
34	ဒေါ် [illegible]	〃	〃	ဟိုလီ	[signature]
35	ဒေါ် [illegible]	〃	〃	〃	[signature]
36	ဦး [illegible]	〃	〃	ဟိုလီ	[signature]
37	ဦး [illegible]	〃	〃	နိုင်ပန်	[signature]
38	ဒေါ် [illegible]	〃	〃	ဟိုလီ	[signature]
39	ဦး [illegible]	〃	〃	〃	[signature]
40	ဦး [illegible]	〃	〃	〃	[signature]
41	ဒေါ် [illegible]	〃	〃	〃	[signature]
42	ဒေါ် [illegible]	〃	〃	〃	[signature]
43	ဒေါ် [illegible]	〃	〃	〃	[signature]
44	ဦး [illegible]	〃	〃	〃	[signature]
45	ဦး [illegible]	〃	〃	〃	[signature]
46	ဦး [illegible]	〃	〃	〃	[signature]
47	ဦး [illegible]	〃	〃	〃	[signature]
48	ဦး [illegible]	〃	〃	〃	[signature]

Lists of Attendee for 1st Public Consultation at Holi village

ရှမ်းပြည်နယ်မြောက်ပိုင်းကွမ်လုံမြို့အနီးသံလွင်မြစ်ကိုဖြတ်သန်းတည်ဆောက်မည့်ကွမ်လုံတံတားတည်ဆောက်ရေးလုပ်ငန်း
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နေ့စွဲ 2.10.2019

	အမည်	မြို့နယ်	ကျေးရွာအုပ်စု	ကျေးရွာ	လက်မှတ်
49	ဒေါ် ဒေါ်ရီ[illegible]	ကွမ်လုံ	ဟိုလီ	ဟိုလီ	
50	ဦး [illegible]	〃	〃	〃	
51	ဦး ကျင်းဆုင်း	〃	〃	〃	
52	ဦး သိဟကောင်	〃	〃	〃	
53	ဦး ဟွယ်ဝိုင်	〃	〃	〃	
54	ဦး ဖော်ရီဒေါ်ရီ	〃	〃	〃	
55	ဦး အင်မောင်ဦး	〃	〃	〃	
56	ဦး [illegible]	〃	〃	〃	
57	ဦး ကျင်းကျော်[illegible]	〃	〃	〃	
58	ဒေါ် ဖွေးဖွေး	〃	〃	〃	
59	မောင် ကျင်းဖော်ရီ	〃	〃	တံတားဦး	
60	ဦးကျော်မြင့်	〃	.	တံတားဖြူ	
61	ဦး [illegible]	〃	〃	ဟိုလီ	
62	ဦး [illegible]	〃	〃	〃	
63	ဒေါ် ဒေါ်ရီ[illegible]	〃	〃	〃	
64	ဒေါ် [illegible]	〃	〃	〃	

Lists of Attendee for 1st Public Consultation at Holi village

ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ကွမ်လုံမြို့အနီးသံလွင်မြစ်ကိုဖြတ်သန်းတည်ဆောက်မည့်ကွမ်လုံတံတားတည်ဆောက်ရေးလုပ်ငန်း
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နေ့စွဲ ....2.10.2019........

	အမည်	မြို့နယ်	ကျေးရွာအုပ်စု	ကျေးရွာ	လက်မှတ်
65	[illegible]	[illegible]	〃	[illegible]	[illegible]
66	[illegible]	〃	〃	[illegible]	[illegible]
67	[illegible]	〃	[illegible]	[illegible]	[illegible]
68	[illegible]	〃	[illegible]	[illegible]	[illegible]
69	[illegible]	〃	[illegible]	[illegible]	[illegible]
70	[illegible]	〃	[illegible]	[illegible]	[illegible]
71	[illegible]	〃	[illegible]	[illegible]	[illegible]
72	[illegible]	〃	〃	〃	[illegible]

Lists of Attendee for 1st Public Consultation at Tone Kyat Village

ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ကွမ်လုံမြို့အနီးသံလွင်မြစ်ကိုဖြတ်သန်းတည်ဆောက်မည့်ကွမ်လုံတံတားတည်ဆောက်ရေးလုပ်ငန်း စဉ်အားအများပြည်သူများနှင့်တိုင်ပင်ဆွေးနွေးခြင်း (EIA Public Consultation Meeting) သို့တက်ရောက်လာသူများစာရင်း

နေ့စွဲ ...2.10.2019...

	အမည်	မြို့နယ်	ကျေးရွာအုပ်စု	ကျေးရွာ	လက်မှတ်
	ဦးအို ကွမ်ဖူး	ကွမ်းလုံ	တုံကျက်	ကျောက်ချင်ရွာ	[signature]
	ဦးရှ လောက်ရှ	〃	〃	〃	[signature]
	ဦးကျန် ခင်းရှန်	〃	〃	〃	[signature]
	ဒေါ်ဝိုး ကျောက်ချင်	〃	〃	〃	[signature]
	ဦးကျ ကြက်ကျော်း	〃	〃	〃	[signature]
	ဦး ဝဖ ဝေလာမှ ချိုင်	〃	〃	〃	[signature]
	ဒေါ် မခိုင်	〃	〃	〃	[signature]
	ဒေါ် [illegible] ကျင်ဖူ	〃	〃	〃	[signature]

Lists of Attendee for 1st Public Consultation at Tone Kyat Village

ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ကွမ်လုံမြို့အနီးသံလွင်မြစ်ကိုဖြတ်သန်းတည်ဆောက်မည့်ကွမ်လုံတံတားတည်ဆောက်ရေးလုပ်ငန်း
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နေ့စွဲ ...2.10.2019........

	အမည်	မြို့နယ်	ကျေးရွာအုပ်စု	ကျေးရွာ	လက်မှတ်
၁။	ဒေါ်ရှုကော်တီး	ကွမ်းလုံ	တုံကျက်	ကျောက်ချမြေ	[signature]
	ဒေါ်ငှန်ခိုက်ဝင်း	〃	〃	〃	[signature]
	ဒေါ်ထူးမွန်	〃	〃	〃	[signature]
	ဒေါ်ဝင်းကျောက်ဆန်း	〃	〃	〃	[signature]
	ဦးကူကျောက်ကိုင်	〃	〃	〃	[signature]
	ဦးကျဲချင်းယို	〃	〃	〃	[signature]
	ဒေါ်ထဲကျောက်ဝင်း	〃	〃	〃	[signature]
	ဦးဒွမ်းကို	〃	〃	〃	[signature]
	ဦးမိုးကျောက်ချန်	〃	〃	〃	[signature]
	ဦးဆို ရူး	〃	〃	〃	[signature]
	ဦးလီလောက်လို	〃	〃	〃	[signature]
	ဦးယန်ဖူးပေါက်	〃	〃	〃	[signature]
	ဦးရှုံ့ ပတ်	〃	〃	〃	[signature]
	ဦးလန်ခိုက်ညိန်	〃	〃	〃	[signature]
	ဦးလီ သောက်ချောင်	〃	〃	〃	[signature]
	ဦးဝမ်ကျန်ဟာ				[signature]

Lists of Attendee for 1st Public Consultation at Tone Kyat Village

ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ကွမ်းလုံမြို့အနီးသံလွင်မြစ်ကိုဖြတ်သန်းတည်ဆောက်မည့်ကွမ်းလုံတံတားတည်ဆောက်ရေးလုပ်ငန်း စဉ်အားအများပြည်သူများနှင့်တိုင်ပင်ဆွေးနွေးခြင်း (EIA Public Consultation Meeting) သို့တက်ရောက်လာသူများစာရင်း

နေ့စွဲ 2.10.2019

	အမည်	မြို့နယ်	ကျေးရွာအုပ်စု	ကျေးရွာ	လက်မှတ်
	ဦး ရန်အောင်အေး	ကွမ်းလုံ	တုံကျက်	ကျက်စင်ကျား	
	ဦး ဂျူအောင်ထွန်း	〃	〃	ကျက်စင်ကျား	
	ဒေါ် ကွမ်းကျိုင်	〃	〃	〃	
	ဦး လီတားခီး	〃	〃	〃	
	ဒေါ် ကျောက်ချီး	〃	〃	〃	
	ဒေါ် ဝမ်ကျောက်ဆွဲ	〃	〃	〃	
	ဒေါ် ကျောင်ခိုင်းလန်	〃	〃	〃	
	ဦး ယူရှိုင်းကျန်း	〃	〃	〃	
	ဒေါ် ကျူကျောက်စီး	〃	〃	〃	
	ဒေါ် ကျူဝင်မေ	〃	〃	〃	
	ဒေါ် လျူးကျောက်ဆိုင်း	〃	〃	〃	
	ဒေါ် ရန်ဝေး	〃	〃	〃	
	ဦး ယွင်ကျိုင်းဂျူ	〃	〃	〃	
	ဦး ဝမ်ကွမ်းယူး	〃	〃	〃	
	ဒေါ် ထွမ်းကျောက်ဂျူ	〃	〃	〃	
	ဒေါ် လီထွန်ဝေး	〃	〃	〃	

Lists of Attendee for 1st Public Consultation at Tone Kyat Village

ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ကွမ်လုံမြို့အနီးသံလွင်မြစ်ကိုဖြတ်သန်းတည်ဆောက်မည့်ကွမ်လုံတံတားတည်ဆောက်ရေးလုပ်ငန်း
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နေ့စွဲ 2.10.2019

	အမည်	မြို့နယ်	ကျေးရွာအုပ်စု	ကျေးရွာ	လက်မှတ်
	ဒေါ် ယွင်ကွန်း	ကွမ်းလုံ	တုံကျက်	ကျောက်ဖူဝါး	
	ဦး ကိုင်ဖူ	〃	〃	〃	
	ဦး ကူကွမ်းလူ	〃	〃	〃	
	ဒေါ် ကိုင် ကွီယင်း	〃	〃	〃	
	ဦး ကျင်းကောက်ကွိုင်	〃	〃	〃	
	ဦး တွဲ ကျောက်စောက်	〃	〃	〃	
	ဦး ကျင်းဆင်ဂျူး	〃	〃	〃	
	ဦး ကူ ကျောက်ကျယ်	〃	〃	〃	
	ဦး ကူ တွဲပွီ	〃	〃	〃	
	ဦး ကောက်ကောက်ဆိုင်	〃	〃	〃	
	ဒေါ် ဂွမ်းဝါ	〃	〃	〃	
	ဦး ဝမ် ဓါ လာ	〃	〃	〃	
	ဦး ကျောက် ရှုး	〃	〃	〃	
	ဦး ဝမ် လူ	〃	〃	〃	
	ဦး ရှီ ဒွီ ဝမ်း	〃	〃	〃	
	ဦး လုံ ဂုဝ်း ရှီ	〃	〃	〃	

Lists of Attendee for 1st Public Consultation at Tone Kyat Village

ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ကွမ်လုံမြို့အနီးသံလွင်မြစ်ကိုဖြတ်သန်းတည်ဆောက်မည့်ကွမ်လုံတံတားတည်ဆောက်ရေးလုပ်ငန်း စဉ်အားအများပြည်သူများနှင့်တိုင်ပင်ဆွေးနွေးခြင်း (EIA Public Consultation Meeting) သို့တက်ရောက်လာသူများစာရင်း

နေ့စွဲ ......2.10.2019.......

	အမည်	မြို့နယ်	ကျေးရွာအုပ်စု	ကျေးရွာ	လက်မှတ်
၁.	ဦး [illegible]	ကွမ်းလုံ	တုံကျတ်	[illegible]	[signature]
၂	ဦး [illegible]	[illegible]	"		[signature]
၃.	ဦး [illegible]	ကွမ်းလုံ	"		[signature]
၄.	ဦး [illegible]	ကွမ်းလုံ	"		[signature]
၅	ဦး [illegible]	ကွမ်းလုံ	[illegible]		[signature]
၆.	ဦး [illegible]	ကွမ်းလုံ	တုံကျတ်	[illegible]	[signature]

11.9 Attendant list for 2nd Public Consultation Meeting (PCM)

List of Attendant at Holi during 2nd PCM

ရှမ်းပြည်နယ်မြောက်ပိုင်း လားရှိုးခရိုင်၊ လားရှိုး-သိန္နီ-ကွမ်းလုံ-ချင်းရွှေဟော်လမ်းပေါ်ရှိ သံလွင်မြစ်ကူး တံတားသစ်(ကွမ်းလုံ)တည်ဆောက်ရေးနှင့်စပ်လျဉ်း၍အများပြည်သူတို့၏အမြင်သဘောထားများရယူရေးဆိုင်ရာ လူထုတွေ့ဆုံဆွေးနွေးပွဲသို့ တက်ရောက်လာသူများစာရင်း

(ဟိုလီ) နေ့စွဲ 14.12.2019

စဉ်	အမည်	မြို့နယ်	ကျေးရွာ	ဖုန်းနံပါတ်	လက်မှတ်
၁။	ဦးဟောင်ဖေါင်	ကွမ်းလုံ	ဟိုလီ	–	[illegible]
၂။	ဦးအယ်ဖေါင်	"	ဟိုလီ	–	[illegible]
၃။	ဦးရှောင်ဖေါင်	"	ဟိုလီ	09-49288507	[illegible]
၄။	ဆရာကျန်းဖေါ်	"	ဟိုလီ	09.78632017	[illegible]
၅။	ဦးရှုန်လောင်တောင်	"	ခိုင်ပန်ရွာ	097827465[illegible]	[illegible]
၆။	ဦးထောင်းလျှမ်း	"	"	–	[illegible]
၇	ဦးခိုင်ဖေါင်	"	ခိုင်ပန်	–	[illegible]
၈	ဦးဟွင်းစိမ်း	"	ဟိုလီ	–	[illegible]
၉	ဦးဖေါ်ဇယ်မ်း	"	ဟိုလီ	09-793182826	[illegible]
၁၀	ဦးတောင်ဖေါင်	"	ခိုင်ပန်	09-78862029	[illegible]
၁၁	ဦးဖြေါင်ဖေါင်	"	"	09-780618068	[illegible]
၁၂	ဦးကွမ်းဖောင်း	"	"	09-7[illegible]62	[illegible]
၁၃	ဦးဖေါင်ရှောင်	"	ဟိုလီ	–	[illegible]
၁၄	ဦးဖြေါင်ဖောက်	"	[illegible]	09-798594101	[illegible]
၁၅	ဦးဖေါင်းအတ်	"	ခိုင်ပန်	–	[illegible]
၁၆	ဦးလီဝင်းမြို	"	ဟိုလီ	–	[illegible]
၁၇	ဦးလောကော်ဖေး	"	"	09-77911028[illegible]	[illegible]
၁၈	ဦးပေဘာတာန်	"	ခိုင်ပန်	09-761701896	[illegible]
၁၉	ဦးလီရှင်းရှောင်	"	ဟိုလီ	09-779110388	[illegible]
၂၀	ဖေါ်ယဲကော်ဖေး	"	"	–	[illegible]
၂၁	[illegible]	"	"	09-777615589	[illegible]
၂၂	ဦးဂိုရိုက်ဂါ	"	"	09-777674486	[illegible]

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List of Attendant at Holi during 2nd PCM

ရှမ်းပြည်နယ်မြောက်ပိုင်း လားရှိုးခရိုင်၊ လားရှိုး-သိန္နီ-ကွမ်းလုံ-ချင်းရွှေဟော်လမ်းပေါ်ရှိ သံလွင်မြစ်ကူး တံတားသစ်(ကွမ်းလုံ)တည်ဆောက်ရေးနှင့်စပ်လျဉ်း၍အများပြည်သူတို့၏အမြင်သဘောထားများရယူ ရေးဆိုင်ရာ လူထုတွေ့ဆုံဆွေးနွေးပွဲသို့ တက်ရောက်လာသူများစာရင်း

(ဟိုလီ) နေ့စွဲ 14.12.2019

စဉ်	အမည်	မြို့နယ်	ကျေးရွာ	ဖုန်းနံပါတ်	လက်မှတ်
၂၃	[illegible]	ကွမ်းလုံ	ဟိုလီ	–	[illegible]
၂၄	[illegible]	ကွမ်းလုံ	〃	–	[illegible]
၂၅	[illegible]	[illegible]	〃	09-7978[illegible]	[illegible]
၂၆	[illegible]	[illegible]	〃	09-72277003	[illegible]
၂၇	Rev. [illegible]	[illegible]	〃	09-7824[illegible]	[illegible]
၂၈	[illegible]	〃	〃	09-785[illegible]	[illegible]
၂၉	[illegible]	[illegible]	[illegible]	–	[illegible]
၃၀	[illegible]	ကွမ်းလုံ	ဟိုလီ	09482512499	[illegible]
၃၁	[illegible]	ကွမ်းလုံ	ဟိုလီ	–	[illegible]
၃၂	[illegible]	ကွမ်းလုံ	ဟိုလီ	–	[illegible]
၃၃	[illegible]	ကွမ်းလုံ	[illegible]	09256132830	[illegible]
၃၄	[illegible]	〃	[illegible]	–	[illegible]
၃၅	[illegible]	〃	ဟိုလီ	–	[illegible]
၃၆	[illegible]	〃	[illegible]	–	[illegible]
၃၇	[illegible]	〃	[illegible]	–	[illegible]
၃၈	[illegible]	〃	ဟိုလီ	–	[illegible]
၃၉	[illegible]	〃	ဟိုလီ	–	[illegible]
၄၀	[illegible]	〃	–	447324250	[illegible]
၄၁	[illegible]	〃	ဟိုလီ	09178263885	[illegible]
၄၂	[illegible]	〃	ဟိုလီ	–	[illegible]
၄၃	[illegible]	〃	ဟိုလီ	09775483385	[illegible]
၄၄	[illegible]	〃	ဟိုလီ	–	[illegible]

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List of Attendant at Holi during 2nd PCM

ရှမ်းပြည်နယ်မြောက်ပိုင်း လားရှိုးခရိုင်၊ လားရှိုး-သိန္နီ-ကွမ်းလုံ-ချင်းရွှေဟော်လမ်းပေါ်ရှိ သံလွင်မြစ်ကူး တံတားသစ်(ကွမ်းလုံ)တည်ဆောက်ရေးနှင့်စပ်လျဉ်း၍အများပြည်သူတို့၏အမြင်သဘောထားများရယူ ရေးဆိုင်ရာ လူထုတွေ့ဆုံဆွေးနွေးပွဲသို့ တက်ရောက်လာသူများစာရင်း

(ဟိုလီ) နေ့စွဲ 14.12.2019

စဉ်	အမည်	မြို့နယ်	ကျေးရွာ	ဖုန်းနံပါတ်	လက်မှတ်
၄၅	ဦး ရှိကျွဲ	ကွမ်းလုံ	ဟိုလီ	09-781388265	
၄၆	ဦး ထွန်းလေး	"	"	09-776877445	
၄၇	ဦး ကျော်ဝင်း	"	"	09-765540918	
၄၈	ဦး ကျန်းဝန်း	"	"	09- –	
၄၉	ဦး ခေါင်စိုင်း	"	"	–	
၅၀	ဦး အိုက်မောင်ရှိ	"	"	–	
၅၁	ဦး ခိုက်ဖုန်	"	"	09767080301	
၅၂	ဒေါ် လော်မိ	"	"	–	
၅၃	ဦး လီလောကျော်	"	"	–	
၅၄	ဒေါ် ဒေါ်ငွေ ဥယ	"	"	–	
၅၅	ဦး ကျော်ရိုးဝင်း	"	"	09-779305829	
၅၆	ဦး လောကဇိုင်း	"	"	–	
၅၇	ဦး ဒေါ်ငယ်	"	"	–	
၅၈	ဒေါ် ဈာင်ရှင်း	"	"	–	
၅၉	ဦး ဘားပွင်	"	"	–	
၆၀	ဦး ကီခီမော	"	"	–	
၆၁	ဦး ဂျပ်မိုးခိုင်	"	"	09-788614090	
၆၂	ဦး လော်လောကာမြင်	"	"	09-794843482	
		"			
		"			
		"			

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List of Attendant at Holi during 2nd PCM

ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ လားရှိုးခရိုင်၊ လားရှိုး-သိန္နီ-ကွမ်းလုံ-ချင်းရွှေဟော်လမ်းပေါ်ရှိ သံလွင်မြစ်ကူးတံတားသစ်(ကွမ်းလုံ)တည်ဆောက်ရေးနှင့်စပ်လျဉ်း၍ အများပြည်သူတို့၏အမြင် သဘောထားများဆိုင်ရာ လူထုတွေ့ဆုံဆွေးနွေးပွဲသို့ တက်ရောက်လာသူများစာရင်း

(ဟိုလီ) နေ့စွဲ 14.12.2019

စဉ်	အမည်	ဌာန	ဖုန်းနံပါတ်	လက်မှတ်
၁။	ဦးမောင်စိန်	အုပ်ချုပ်ရေးမှူး / ဟိုလီ	09-771777662	[signature]
၂။	ဦးသူရသန့်	[illegible] (၄)	09-251769223	[signature]
၃။	ဦးမြတ်ကျော်	"	09-446431451	[signature]
၄။	ဦးသစ်မြတ်အောင်	ကွမ်းလုံ [illegible]	09-793976355	[signature]
၅။	ဦးအောင်ကို	SP	-	[signature]
၆။	ဦးသန်းထိုက်ဦး	[illegible] (ကွမ်းလုံ)	097843741[illegible]	[signature]
၇။	ဦးကျော်စော	OHC	09263390044	[signature]
၈။	ဦးဝင်းနိုင်	OHC	09254798062	[signature]
၉။	ဦးတင်ဝိုး	[illegible]	09421761779	[signature]

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List of Attendant at Ton Kyat during 2nd PCM

ရှမ်းပြည်နယ်မြောက်ပိုင်း လားရှိုးခရိုင်၊ လားရှိုး-သိန္နီ-ကွမ်းလုံ-ချင်းရွှေဟော်လမ်းပေါ်ရှိ သံလွင်မြစ်ကူး
တံတားသစ်(ကွမ်းလုံ)တည်ဆောက်ရေးနှင့်စပ်လျဉ်း၍အများပြည်သူတို့၏အမြင်သဘောထားများရယူ
ရေးဆိုင်ရာ လူထုတွေ့ဆုံဆွေးနွေးပွဲသို့ တက်ရောက်လာသူများစာရင်း

(တုံကြက်)နေ့စွဲ--14-12-2019

စဉ်	အမည်	မြို့နယ်	ကျေးရွာ	ဖုန်းနံပါတ်	လက်မှတ်
၁	ဦးထိုက်ဘယ်	ကွမ်းလုံ	တုံကြက်		
၂	ဦးတုံဖာ	"	"		
၃	ဦးခွန်းကို	"	"		
၄	ဦးဖေကျော်	"	"		
၅	ဦးကျော်ဆောက်ခိုင်	"	"		
၆	ဦးကျော်ရှင်ယခုန်	"	"		
၇	ဦးဆောက်ဆုဖာ	"	"		
၈	ဦးဆောက်ဦး	"	"		
၉	ဒေါ်ကိုကွင်းဖာ	"	"		
၁၀	ဒေါ်ကျွမ်းဆော်	"	"		
၁၁	ဒေါ်လုံဆောက်ကြီး	"	"		
၁၂	ဒေါ်ကျော့ဆဲ	"	"		
၁၃	ဒေါ်ခွမ်ရှင်း	"	"		
၁၄	ဦးဟွန်ကျော်ဦး	"	"		
၁၅	ဦးကျော်ဆောက်ဆောက်	"	"		
၁၆	ဦးဒေါ်ဆောက်ကြီး	"	"		
၁၇	ဒေါ်ကွမ်းကျော်	"	"		
၁၈	ဒေါ်ကျော်လုံရှ	"	"		
၁၉	ဦးဆော်ကွမ်းတိ	"	"		
၂၀	ဒေါ်ဝမ်ဆောက်မြဲ	"	"		
၂၁	ဒေါ်ဒေါ်ဒေါ်ခိုင်	"	"		
၂၂	ဦးဆောက်ဆောင်ရောက်	"	"		

List of Attendant at Ton Kyat during 2nd PCM

ရှမ်းပြည်နယ်မြောက်ပိုင်း လားရှိုးခရိုင်၊ လားရှိုး-သိန္နီ-ကွမ်းလုံ-ချင်းရွှေဟော်လမ်းပေါ်ရှိ သံလွင်မြစ်ကူး တံတားသစ်(ကွမ်းလုံ)တည်ဆောက်ရေးနှင့်စပ်လျဉ်း၍အများပြည်သူတို့၏အမြင်သဘောထားများရယူ ရေးဆိုင်ရာ လူထုတွေ့ဆုံဆွေးနွေးပွဲသို့ တက်ရောက်လာသူများစာရင်း

(တုံကြက်) နေ့စွဲ 14-12-2019

စဉ်	အမည်	မြို့နယ်	ကျေးရွာ	ဖုန်းနံပါတ်	လက်မှတ်
၂၃	ပုံချိုး	ကွမ်းလုံ	တုံကြက်		[signature]
၂၄	ဦး ကီ တောက်ပုံ	〃	〃		[signature]
၂၅	ဝမ် အောင်း	〃	〃		[signature]
၂၆	ပေါက်ပေါက်စိုး	〃	〃		[signature]
၂၇	ဦး ဝမ်ကျော်လှ	〃	〃		[signature]
၂၈	ဦး စင်ရှု	〃	〃		[signature]
၂၉	ဒေါ် ရင် မိတ်	〃	〃		[signature]
၃၀	ဒေါ်ယုဝင်း	〃	〃		[signature]
၃၁	ဒေါ်တူမေ	〃	〃		[signature]

List of Attendant at Ton Kyat during 2nd PCM

ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ လားရှိုးခရိုင်၊ လားရှိုး-သိန္နီ-ကွမ်းလုံ-ချင်းရွှေဟော်လမ်းပေါ်ရှိ သံလွင်
မြစ်ကူးတံတားသစ်(ကွမ်းလုံ)တည်ဆောက်ရေးနှင့်စပ်လျဉ်း၍ အများပြည်သူတို့၏အမြင်
သဘောထားများဆိုင်ရာ လူထုတွေ့ဆုံဆွေးနွေးပွဲသို့ တက်ရောက်လာသူများစာရင်း

(တုံကြက်) နေ့စွဲ 14.12.2019

စဉ်	အမည်	ဌာန	ဖုန်းနံပါတ်	လက်မှတ်
၁။	ဦးလောက်မား	အုပ်ချုပ်ရေးမှူး၊ တုံကြက်		
၂။	ဦးတင့်နိုင်ဝင်း	ဆွေ့အုပ်	09-261072512	
၃။	ဦးသူရသန့်	တံတားအာရုံးအဖွဲ့ (၄)	09-251769223	
၄။	ဦးမြတ်ကျော်	"	09-446431451	
၅။	ဦးသစ်မြတ်အောင်	ကွမ်းလုံ ရပ်ကွက်	09-793976355	
၆။	ဦးဖေသာင်ကျော်	SP		
၇။	ဦးသန်းဇော်ဦး	စဂျယ (ကွမ်းလုံ)	09784374168	
၈။	ဦးကျော်ဇော	OHC	09263390044	
၉။	ဦးဝင်းနိုင်	OHC	09-254798062	
၁၀။	ဦးတင်မိုး	လားရှိုးဗိုးရွာ	09-421761779	

11.10 Laboratory analysis results for soil

Soil Quality Laboratory Results - first season survey

Analysis Report

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF EDUCATION
DEPARTMENT OF RESEARCH AND INNOVATION
ANALYSIS DEPARTMENT
No.(6) KABA AYE PAGODA ROAD, YANGON

Reference: Social & Environmental Associates- Myanmar

Sample: Soil

RESULT

Sample No.		092/19-20
Job No.		J-092
Sample Marked.		Soil KSL-1
Cadmium as Cd	(mg/kg)	5.60
Chromium as Cr	(mg/kg)	36.38
Copper as Cu	(mg/kg)	18.19
Lead as Pb	(mg/kg)	46.65
Nickel as Ni	(mg/kg)	62.76
Zinc as Zn	(mg/kg)	44.17
Arsenic as As	(mg/kg)	0.06
Nitrogen as N	(%)	N.D
Phosphorous as P	(%)	N.D
Potassium as K	(%)	1.56
pH Value(10%Solution)		7.21

N.D=Not Detected

Not a Certificate of Conformance
စံချိန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: *Results valid for the received sample only.*

Method/ Equipment used: Arthur I Vogel, F.A.A.S, Nitrogen Analyzer

Tested by: Daw Khin Thida Myo

Daw Htike Htike Oo

Checked by: Dr. Khin Aye Tue

Technical Director: U Win Khaing Moe FOR

Our Reference: 144
Date: 7-11-19

Analysis Report

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF EDUCATION
DEPARTMENT OF RESEARCH AND INNOVATION
ANALYSIS DEPARTMENT
No.(6) KABA AYE PAGODA ROAD, YANGON

Reference: Social & Environmental Associates- Myanmar

Sample: Soil

RESULT

Sample No.		093/19-20
Job No.		J-093
Sample Marked.		Soil KSL-2
Cadmium as Cd	(mg/kg)	1.97
Chromium as Cr	(mg/kg)	87.94
Copper as Cu	(mg/kg)	19.87
Lead as Pb	(mg/kg)	42.18
Nickel as Ni	(mg/kg)	44.07
Zinc as Zn	(mg/kg)	75.74
Arsenic as As	(mg/kg)	0.03
Nitrogen as N	(%)	N.D
Phosphorous as P	(%)	N.D
Potassium as K	(%)	3.53
pH Value(10%Solution)		7.01

N.D=Not Detected

Not a Certificate of Conformance
စံချိန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: *Results valid for the received sample only.*

Method/ Equipment used: Arthur I Vogel, F.A.A.S, Nitrogen Analyzer

Tested by: Daw Khin Thida Myo

Daw Htike Htike Oo

Checked by: Dr. Khin Aye Tue

FOR
Technical Director: U Win Khaing Moe

Our Reference: 144
Date: 7-11-19

Analysis Report

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF EDUCATION
DEPARTMENT OF RESEARCH AND INNOVATION
ANALYSIS DEPARTMENT
No.(6) KABA AYE PAGODA ROAD, YANGON

Reference: Social & Environmental Associates- Myanmar

Sample: Soil

RESULT

Sample No.		094/19-20
Job No.		J-094
Sample Marked.		Soil KSL-3
Cadmium as Cd	(mg/kg)	4.51
Chromium as Cr	(mg/kg)	46.11
Copper as Cu	(mg/kg)	20.41
Lead as Pb	(mg/kg)	43.15
Nickel as Ni	(mg/kg)	56.12
Zinc as Zn	(mg/kg)	49.25
Arsenic as As	(mg/kg)	0.08
Nitrogen as N	(%)	N.D
Phosphorous as P	(%)	N.D
Potassium as K	(%)	1.13
pH Value(10%Solution)		7.50

N.D=Not Detected

Not a Certificate of Conformance
စံချိန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: *Results valid for the received sample only.*

Method/ Equipment used: Arthur I Vogel, F.A.A.S, Nitrogen Analyzer

Tested by: Daw Khin Thida Myo

Checked by: Dr. Khin Aye Tue

Daw Htike Htike Oo

Technical Director: U Win Khaing Moe FOR

Our Reference: 144
Date: 7-11-19

Analysis Report

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF EDUCATION
DEPARTMENT OF RESEARCH AND INNOVATION
ANALYSIS DEPARTMENT
No.(6) KABA AYE PAGODA ROAD, YANGON

Reference: Social & Environmental Associates- Myanmar

Sample: Soil

RESULT

Sample No.		095/19-20
Job No.		J-095
Sample Marked.		Soil KSL-4
Cadmium as Cd	(mg/kg)	1.97
Chromium as Cr	(mg/kg)	120.41
Copper as Cu	(mg/kg)	30.59
Lead as Pb	(mg/kg)	35.75
Nickel as Ni	(mg/kg)	60.40
Zinc as Zn	(mg/kg)	62.77
Arsenic as As	(mg/kg)	0.08
Nitrogen as N	(%)	N.D
Phosphorous as P	(%)	N.D
Potassium as K	(%)	2.94
pH Value(10%Solution)		7.30

N.D=Not Detected

Not a Certificate of Conformance
စံချိန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: *Results valid for the received sample only.*

Method/ Equipment used: Arthur I Vogel, F.A.A.S, Nitrogen Analyzer

Tested by: Daw Khin Thida Myo

Checked by: Dr. Khin Aye Tue

Daw Htike Htike Oo

Technical Director: U Win Khaing Moe

Our Reference: 144
Date: 7-11-19

Soil Quality Laboratory Results - Second season survey

Analysis Report

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF EDUCATION
DEPARTMENT OF RESEARCH AND INNOVATION
ANALYSIS DEPARTMENT
No.(6) KABA AYE PAGODA ROAD, YANGON

Reference: Social & Environmental Associates- Myanmar

Sample: Soil

RESULT

Sample No.		835/19-20
Job No.		J-834
Sample Marked.		Soil KLS-1
Cadmium as Cd	(mg/kg)	4.76
Chromium as Cr	(mg/kg)	96.94
Copper as Cu	(mg/kg)	18.64
Lead as Pb	(mg/kg)	38.07
Nickel as Ni	(mg/kg)	51.15
Zinc as Zn	(mg/kg)	52.14
Arsenic as As	(mg/kg)	<0.005
Nitrogen as N	(%)	N.D
Phosphorous as P	(%)	N.D
Potassium as K	(%)	1.14
pH Value(10%Solution)		7.10

N.D=Not Detected

Not a Certificate of Conformance
စံချိန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: *Results valid for the received sample only.*

Method/ Equipment used: Arthur I Vogel, F.A.A.S, Nitrogen Analyzer, Indian Standard

Tested by: Daw Khin Thida Myo

Daw Htike Htike Oo

Checked by: Dr. Khin Aye Tue

Technical Director: U Win Khaing Moe

Our Reference: 374
Date: 13.1.2020

Analysis Report

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF EDUCATION
DEPARTMENT OF RESEARCH AND INNOVATION
ANALYSIS DEPARTMENT
No.(6) KABA AYE PAGODA ROAD, YANGON

Reference: Social & Environmental Associates- Myanmar

Sample: Soil

RESULT

Sample No.		836/19-20
Job No.		J-835
Sample Marked.		Soil KLS-2
Cadmium as Cd	(mg/kg)	2.59
Chromium as Cr	(mg/kg)	151.69
Copper as Cu	(mg/kg)	26.75
Lead as Pb	(mg/kg)	23.95
Nickel as Ni	(mg/kg)	33.13
Zinc as Zn	(mg/kg)	72.65
Arsenic as As	(mg/kg)	<0.005
Nitrogen as N	(%)	N.D
Phosphorous as P	(%)	N.D
Potassium as K	(%)	1.75
pH Value(10%Solution)		7.21

N.D=Not Detected

Not a Certificate of Conformance
စံချိန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: *Results valid for the received sample only.*

Method/ Equipment used: Arthur I Vogel, F.A.A.S, Nitrogen Analyzer, Indian Standard

Tested by: Daw Khin Thida Myo

Checked by: Dr. Khin Aye Tue

Daw Htike Htike Oo

Technical Director: U Win Khaing Moe

Our Reference: 374
Date: 13.1.2020

Analysis Report

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF EDUCATION
DEPARTMENT OF RESEARCH AND INNOVATION
ANALYSIS DEPARTMENT
No.(6) KABA AYE PAGODA ROAD, YANGON

Reference: Social & Environmental Associates- Myanmar

Sample: Soil

RESULT

Sample No.		837/19-20
Job No.		J-836
Sample Marked.		Soil KLS-3
Cadmium as Cd	(mg/kg)	3.37
Chromium as Cr	(mg/kg)	115.89
Copper as Cu	(mg/kg)	25.00
Lead as Pb	(mg/kg)	36.52
Nickel as Ni	(mg/kg)	39.87
Zinc as Zn	(mg/kg)	57.95
Arsenic as As	(mg/kg)	0.01
Nitrogen as N	(%)	N.D
Phosphorous as P	(%)	N.D
Potassium as K	(%)	1.14
pH Value(10%Solution)		7.12

N.D=Not Detected

Not a Certificate of Conformance
စံချိန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: *Results valid for the received sample only.*

Method/ Equipment used: Arthur I Vogel, F.A.A.S, Nitrogen Analyzer, Indian Standard

Tested by: Daw Khin Thida Myo

Daw Htike Htike Oo

Checked by: Dr. Khin Aye Tue

Technical Director: U Win Khaing Moe

Our Reference: 374
Date: 13.1.2020

Analysis Report

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF EDUCATION
DEPARTMENT OF RESEARCH AND INNOVATION
ANALYSIS DEPARTMENT
No.(6) KABA AYE PAGODA ROAD, YANGON

Reference: Social & Environmental Associates- Myanmar

Sample: Soil

RESULT

Sample No.		838/19-20
Job No.		J-837
Sample Marked.		Soil KLS-4
Cadmium as Cd	(mg/kg)	2.96
Chromium as Cr	(mg/kg)	97.19
Copper as Cu	(mg/kg)	20.74
Lead as Pb	(mg/kg)	27.66
Nickel as Ni	(mg/kg)	45.63
Zinc as Zn	(mg/kg)	48.23
Arsenic as As	(mg/kg)	<0.005
Nitrogen as N	(%)	N.D
Phosphorous as P	(%)	N.D
Potassium as K	(%)	1.08
pH Value(10%Solution)		7.30

N.D=Not Detected

Not a Certificate of Conformance
စံချိန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: *Results valid for the received sample only.*

Method/ Equipment used: Arthur I Vogel, F.A.A.S, Nitrogen Analyzer, Indian Standard

Tested by: Daw Khin Thida Myo

Daw Htike Htike Oo

Checked by: Dr. Khin Aye Tue

Technical Director: U Win Khaing Moe

11.11 Laboratory analysis results for water

Water Quality Laboratory Results - first season survey

ပတ်ဝန်းကျင်ရေးရာဓာတ်ခွဲခန်း
Ecological Laboratory

စိမ်းလန်းအဓိမြေဖွံ့ဖြိုးတိုးတက်ရေးအသင်း (Advancing Life and Regenerating Motherland, ALARM)

Reference Number/ စာအမှတ်: EL-R / 03738

Date / နေ့စွဲ: 16 October, 2019

Laboratory Analysis Report /ဓာတ်ခွဲစစ်ဆေးမှုအစီအရင်ခံစာ

Sample Profileနမူနာရာဇဝင်

နမူနာအမည် /Sample Name	KLB - 1	နမူနာအမှတ်/ Sample ID	5712	
နေရာ (မြို့နယ်) Location (Township)	ကွမ်လုံ	လတ္တီတွဒ် Latitude	-	
နေရာ (တိုင်း/ပြည်နယ်) Location (Division/State)	ရှမ်းပြည်မြောက်ပိုင်း	လောင်ဂျီတွဒ် Longitude	-	
ပေးပို့သူအမည် Sender Name	Social & Environmental Associate Myanmar	နမူနာကောက်ယူချိန် (နေ့၊ နာရီ) Sampling Time (Date, Time)	1.10.2019	9:09 am
အဖွဲ့အစည်းOrganisation	-			
ဆက်သွယ်ရန် Contact	09978884840	နမူနာရောက်ရှိချိန် (နေ့၊ နာရီ) Arriving Time (Date, Time)	4.10.2019	-

(This laboratory analysis report is based solely on the sample submitted by the customer)
(ဤဓာတ်ခွဲစစ်ဆေးမှုအစီရင်ခံစာသည် ပေးပို့သူမှပို့ဆောင်ခဲ့သည့်နမူနာကိုသာအခြေခံထားပါသည်။)

Analysis Results စမ်းသပ်ချက်အဖြေ

စဉ် Sr.	အရည်အသွေးညွှန်းကိန်း Quality Parameter	ရလဒ် အဖြေ Results		နည်းစဉ် Method	စံသတ်မှတ်ချက် Drinking Standard	စွန့်ရေ စံနှုန်း Effluent Standard	မှတ်ချက် Remarks
1	ချဉ်ဖန်ကိန်း (pH)	8.2		HANNA HI 98129, 98130 Water Proof pH Tester (Electrode Method)	6.5 – 8.5	6.0 – 9.0 *	Normal
2	ဆိုင်းကြွအနယ် (TSS)	79	mg/L	Lovibond SpectroDirect Method No. 383	NG	≤50 mg/L *	Above the limit
3	ဇီဝဆိုင်ရာ အောက်ဆီဂျင် လိုအပ်ချက် (BOD_5)	4.6	mg/L	Estimated by Eco-Lab with Jenway Dissolved Oxygen Meter (Model 970)	≤ 3 mg/L	≤ 50 mg/L *	Above DW limit
4	ဓာတုဆိုင်ရာ အောက်ဆီဂျင် လိုအပ်ချက် (COD)	<30	mg/L	Lovibond SpectroDirect Method No. 130, 131, 132	NG	≤ 250 mg/L *	Normal
5	ဆိုင်ယန်နိုက် (Free Cyanide)	<0.01	mg/L	Lovibond SpectroDirect Method No. 157	≤ 0.07 mg/L	≤ 0.1 mg/L *	Normal
6	မီးစုန်းဓာတ် (Phosphorous)	<0.3	mg/L	Lovibond SpectroDirect Method No. 320, 321	NG	2 mg/L *	Normal
7	ခဲ သတ္တုဓါတ် (Lead)	0.1	mg/L	AAS, Shimadzu AA-6200 Pb (283.3 nm)	≤ 0.01 mg/L	≤ 0.1 mg/L *	Above DW limit
8	Total Nitrogen	<5	mg/L	Lovibond SpectroDirect Method No. 283	-	<10 mg/L	Normal

* Myanmar Emission Guideline 2015 NG=No Guideline ND= Not Detected

စမ်းသပ်ပြီး Tested by — Daw May Myat Khine, Lab. Technician II, Ecological Laboratory, ALARM

စစ်ဆေးပြီး Checked by — Daw Lin Myat Myat Aung, Lab. Technician I, Ecological Laboratory, ALARM

တာဝန်ခံApproved by — Dr. Aye Aye Win, Laboratory In-Charge, Ecological Laboratory (ALARM)

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ပတ်ဝန်းကျင်ရေးရာဓာတ်ခွဲခန်း
Ecological Laboratory

စိမ်းလန်းအဓိမြေဖွံ့ ဖြိုးတိုးတက်ရေးအသင်း (Advancing Life and Regenerating Motherland, ALARM)

Reference Number/ စာအမှတ်: EL-R / 03738

Date / နေ့စွဲ: 10 October, 2019

Laboratory Analysis Report /ဓာတ်ခွဲစစ်ဆေးမှုအစီအရင်ခံစာ

Sample Profileနမူနာရာဇဝင်

နမူနာအမည် /Sample Name	KLB - 1	နမူနာအမှတ်/ Sample ID	5712	
နေရာ (မြို့နယ်) Location (Township)	ကွမ်လုံ	လတ္တီတွဒ် Latitude	-	
နေရာ (တိုင်း/ပြည်နယ်) Location (Division/State)	ရှမ်းပြည်မြောက်ပိုင်း	လောင်ဂျီတွဒ် Longitude	-	
ပေးပို့သူအမည် Sender Name	Social & Environmental Associate Myanmar	နမူနာကောက်ယူချိန် (နေ့၊ နာရီ) Sampling Time (Date, Time)	1.10.2019	9:09 am
အဖွဲ့အစည်းOrganisation	-			
ဆက်သွယ်ရန် Contact	09978884840	နမူနာရောက်ရှိချိန် (နေ့၊ နာရီ) Arriving Time (Date, Time)	4.10.2019	-

(This laboratory analysis report is based solely on the sample submitted by the customer)

(ဤဓာတ်ခွဲစစ်ဆေးမှုအစီရင်ခံစာသည် ပေးပို့သူမှပို့ဆောင်ခဲ့သည့်နမူနာကိုသာအခြေခံထားပါသည်။)

Water Sample Analysis Results for Oil & Grease ရေနမူနာစမ်းသပ်ချက် အဖြေ

စဉ် Sr.	အရည်အသွေးညွှန်းကိန်း Quality Parameter	ရလဒ် အဖြေ Results		နည်းစဉ် Method	သောက်ရေ စံနှုန်း Drinking Standard	စွန့်ပစ်ရေ စံနှုန်း Effluent Standard	မှတ်ချက် Remarks
၁	Oil & Grease	4	mg/L	Liquid-Liquid Pertition Gravimetric Method	-	≤10 mg/L *	Normal

* Myanmar Emission Guideline 2015 NG=No Guideline ND= Not Detected

စမ်းသပ်ပြီး Tested by	စစ်ဆေးပြီး Checked by	တာဝန်ခံApproved by
Zaw Winn Kyaw Assistant Technician (II) Ecological Laboratory ALARM	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory ALARM	Dr. Aye Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

A-2, Kan Street, Hlaing Township, 11051, Yangon, Myanmar. Tel: +95 1 503301 | Fax: +95 1 503302

Email: alarm.myanmar@gmail.com | website: www.myanmaraffairs.com

ပတ်ဝန်းကျင်ရေးရာဓာတ်ခွဲခန်း
Ecological Laboratory

စိမ်းလန်းအမိမြေဖွံ့ဖြိုးတိုးတက်ရေးအသင်း (Advancing Life and Regenerating Motherland, ALARM)

Reference Number/ စာအမှတ်: EL-R / 03739

Date / နေ့စွဲ: 16 October, 2019

Laboratory Analysis Report /ဓာတ်ခွဲစစ်ဆေးမှုအစီအရင်ခံစာ

Sample Profileနမူနာရာဇဝင်

နမူနာအမည် /Sample Name	KLB - 2	နမူနာအမှတ်/ Sample ID	5713	
နေရာ (မြို့နယ်) Location (Township)	ကွမ်လုံ	လတ္တီတွဒ် Latitude	-	
နေရာ (တိုင်း/ပြည်နယ်) Location (Division/State)	ရှမ်းပြည်မြောက်ပိုင်း	လောင်ဂျီတွဒ် Longitude	-	
ပေးပို့သူအမည် Sender Name	Social & Environmental Associate Myanmar	နမူနာကောက်ယူချိန် (နေ့၊ နာရီ) Sampling Time (Date, Time)	1.10.2019	10:05 am
အဖွဲ့အစည်းOrganisation	-			
ဆက်သွယ်ရန် Contact	09978884840	နမူနာရောက်ရှိချိန် (နေ့၊ နာရီ) Arriving Time (Date, Time)	4.10.2019	-

(This laboratory analysis report is based solely on the sample submitted by the customer)

(ဤဓာတ်ခွဲစစ်ဆေးမှုအစီရင်ခံစာသည် ပေးပို့သူမှပို့ဆောင်ခဲ့သည့်နမူနာကိုသာအခြေခံထားပါသည်။)

Analysis Results စမ်းသပ်ချက်အဖြေ

စဉ် Sr.	အရည်အသွေးညွှန်းကိန်း Quality Parameter	ရလဒ် အဖြေ Results		နည်းစဉ် Method	စံသတ်မှတ်ချက် Drinking Standard	စွန့်ရေ စံနှုန်း Effluent Standard	မှတ်ချက် Remarks
1	ချဉ်ဖန်ကိန်း (pH)	7.9		HANNA HI 98129, 98130 Water Proof pH Tester (Electrode Method)	6.5 – 8.5	6.0 – 9.0 *	Normal
2	ဆိုင်းကြွအနယ် (TSS)	91	mg/L	Lovibond SpectroDirect Method No. 383	NG	≤50 mg/L *	Above the limit
3	ဇီဝဆိုင်ရာ အောက်ဆီဂျင် လိုအပ်ချက် (BOD_5)	4.3	mg/L	Estimated by Eco-Lab with Jenway Dissolved Oxygen Meter (Model 970)	≤ 3 mg/L	≤ 50 mg/L *	Above DW limit
4	ဓာတုဆိုင်ရာ အောက်ဆီဂျင် လိုအပ်ချက် (COD)	<30	mg/L	Lovibond SpectroDirect Method No. 130, 131, 132	NG	≤ 250 mg/L *	Normal
5	ဆိုင်ယမ်နိုက် (Free Cyanide)	<0.01	mg/L	Lovibond SpectroDirect Method No. 157	≤ 0.07 mg/L	≤ 0.1 mg/L *	Normal
6	မီးစုန်းဓာတ် (Phosphorous)	<0.3	mg/L	Lovibond SpectroDirect Method No. 320, 321	NG	2 mg/L *	Normal
7	ခဲ သတ္တုဓါတ် (Lead)	0.1	mg/L	AAS, Shimadzu AA-6200 Pb (283.3 nm)	≤ 0.01 mg/L	≤ 0.1 mg/L *	Above DW limit
8	Total Nitrogen	<5	mg/L	Lovibond SpectroDirect Method No. 283	-	<10 mg/L	Normal

* Myanmar Emission Guideline 2015   NG=No Guideline   ND= Not Detected

စမ်းသပ်ပြီး Tested by	စစ်ဆေးပြီး Checked by	တာဝန်ခံApproved by
Daw May Myat Khine Lab. Technician II Ecological Laboratory ALARM	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory ALARM	Dr. Aye Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

A-2, Kan Street, Hlaing Township, 11051, Yangon, Myanmar. Tel: +95 1 503301 | Fax: +95 1 503302
Email: alarm.myanmar@gmail.com | website: www.myanmaraffairs.com

ပတ်ဝန်းကျင်ရေးရာဓာတ်ခွဲခန်း
Ecological Laboratory

စိမ်းလန်းအဓိဓမြေဖွံ့ဖြိုးတိုးတက်ရေးအသင်း (Advancing Life and Regenerating Motherland, ALARM)

Reference Number/ စာအမှတ်: EL-R / 03739

Date / နေ့စွဲ: 10 October, 2019

Laboratory Analysis Report /ဓာတ်ခွဲစစ်ဆေးမှုအစီအရင်ခံစာ

Sample Profileနမူနာရာဇဝင်

နမူနာအမည် /Sample Name	KLB - 2	နမူနာအမှတ်/ Sample ID	5713	
နေရာ (မြို့နယ်) Location (Township)	ကွမ်လုံ	လတ္တီတွဒ် Latitude	-	
နေရာ (တိုင်း/ပြည်နယ်) Location (Division/State)	ရှမ်းပြည်မြောက်ပိုင်း	လောင်ဂျီတွဒ် Longitude	-	
ပေးပို့သူအမည် Sender Name	Social & Environmental Associate Myanmar	နမူနာကောက်ယူချိန် (နေ့၊ နာရီ) Sampling Time (Date, Time)	1.10.2019	10:05 am
အဖွဲ့အစည်းOrganisation	-			
ဆက်သွယ်ရန် Contact	09978884840	နမူနာရောက်ရှိချိန် (နေ့၊ နာရီ) Arriving Time (Date, Time)	4.10.2019	-

(This laboratory analysis report is based solely on the sample submitted by the customer)

(ဤဓာတ်ခွဲစစ်ဆေးမှုအစီရင်ခံစာသည် ပေးပို့သူမှပို့ဆောင်ခဲ့သည့်နမူနာကိုသာအခြေခံထားပါသည်။)

Water Sample Analysis Results for Oil & Grease ရေနမူနာစမ်းသပ်ချက် အဖြေ

စဉ် Sr.	အရည်အသွေးညွှန်းကိန်း Quality Parameter	ရလဒ် အဖြေ Results		နည်းစဉ် Method	သောက်ရေ စံနှုန်း Drinking Standard	စွန့်ပစ်ရေ စံနှုန်း Effluent Standard	မှတ်ချက် Remarks
၁	Oil & Grease	3	mg/L	Liquid-Liquid Pertition Gravimetric Method	-	≤10 mg/L *	Normal

* Myanmar Emission Guideline 2015 NG=No Guideline ND= Not Detected

စမ်းသပ်ပြီး Tested by	စစ်ဆေးပြီး Checked by	တာဝန်ခံApproved by
Zaw Winn Kyaw Assistant Technician (II) Ecological Laboratory ALARM	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory ALARM	Dr. Aye Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

A-2, Kan Street, Hlaing Township, 11051, Yangon, Myanmar. Tel: +95 1 503301 | Fax: +95 1 503302

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ပတ်ဝန်းကျင်ရေးရာဓာတ်ခွဲခန်း

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စိမ်းလန်းအမိမြေဖွံ့ဖြိုးတိုးတက်ရေးအသင်း (Advancing Life and Regenerating Motherland, ALARM)

Reference Number/ စာအမှတ်: EL-R / 03740

Date / နေ့စွဲ: 16 October, 2019

Laboratory Analysis Report /ဓာတ်ခွဲစစ်ဆေးမှုအစီအရင်ခံစာ

Sample Profileနမူနာရာဇဝင်

နမူနာအမည် /Sample Name	KLB - 3	နမူနာအမှတ်/ Sample ID	5714	
နေရာ (မြို့နယ်) Location (Township)	ကွမ်လုံ	လတ္တီတွဒ် Latitude	-	
နေရာ (တိုင်း/ပြည်နယ်) Location (Division/State)	ရှမ်းပြည်မြောက်ပိုင်း	လောင်ဂျီတွဒ် Longitude	-	
ပေးပို့သူအမည် Sender Name	Social & Environmental Associate Myanmar	နမူနာကောက်ယူချိန် (နေ့၊ နာရီ) Sampling Time (Date, Time)	1.10.2019	10:35 am
အဖွဲ့အစည်းOrganisation	-			
ဆက်သွယ်ရန် Contact	09978884840	နမူနာရောက်ရှိချိန် (နေ့၊ နာရီ) Arriving Time (Date, Time)	4.10.2019	-

(This laboratory analysis report is based solely on the sample submitted by the customer)

(ဤဓာတ်ခွဲစစ်ဆေးမှုအစီရင်ခံစာသည် ပေးပို့သူမှပို့ဆောင်ခဲ့သည့်နမူနာကိုသာအခြေခံထားပါသည်။)

Analysis Results စမ်းသပ်ချက်အဖြေ

စဉ် Sr.	အရည်အသွေးညွှန်းကိန်း Quality Parameter	ရလဒ် အဖြေ Results		နည်းစဉ် Method	စံသတ်မှတ်ချက် Drinking Standard	စွန့်ပစ် စံနှုန်း Effluent Standard	မှတ်ချက် Remarks
1	ချဉ်ဖန်ကိန်း (pH)	8		HANNA HI 98129, 98130 Water Proof pH Tester (Electrode Method)	6.5 – 8.5	6.0 – 9.0 *	Normal
2	ဆိုင်းကြွအနယ် (TSS)	90	mg/L	Lovibond SpectroDirect Method No. 383	NG	≤50 mg/L *	Above DW limit
3	ဇီဝဆိုင်ရာ အောက်ဆီဂျင် လိုအပ်ချက် (BOD_5)	4.2	mg/L	Estimated by Eco-Lab with Jenway Dissolved Oxygen Meter (Model 970)	≤ 3 mg/L	≤ 50 mg/L *	Above DW limit
4	ဓာတုဆိုင်ရာ အောက်ဆီဂျင် လိုအပ်ချက် (COD)	<30	mg/L	Lovibond SpectroDirect Method No. 130, 131, 132	NG	≤ 250 mg/L *	Normal
5	ဆိုင်ယမ်နိုက် (Free Cyanide)	<0.01	mg/L	Lovibond SpectroDirect Method No. 157	≤ 0.07 mg/L	≤ 0.1 mg/L *	Normal
6	မီးစုန်းဓာတ် (Phosphorous)	<0.3	mg/L	Lovibond SpectroDirect Method No. 320, 321	NG	2 mg/L *	Normal
7	ခဲ သတ္တုဓါတ် (Lead)	ND	mg/L	AAS, Shimadzu AA-6200 Pb (283.3 nm)	≤ 0.01 mg/L	≤ 0.1 mg/L *	Lower limit of detection=0.1 mg/L
8	Total Nitrogen	<5	mg/L	Lovibond SpectroDirect Method No. 283	-	<10 mg/L	Normal

* Myanmar Emission Guideline 2015 NG=No Guideline ND= Not Detected

စမ်းသပ်ပြီး Tested by — Daw May Myat Khine, Lab. Technician II, Ecological Laboratory, ALARM

စစ်ဆေးပြီး Checked by — Daw Lin Myat Myat Aung, Lab. Technician I, Ecological Laboratory, ALARM

တာဝန်ခံApproved by — Dr. Aye Aye Win, Laboratory In-Charge, Ecological Laboratory, (ALARM)

A-2, Kan Street, Hlaing Township, 11051, Yangon, Myanmar. Tel: +95 1 503301 | Fax: +95 1 503302

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ပတ်ဝန်းကျင်ရေးရာဓာတ်ခွဲခန်း
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စိမ်းလန်းအဓိမြေဖွံ့ဖြိုးတိုးတက်ရေးအသင်း (Advancing Life and Regenerating Motherland, ALARM)

Reference Number/ စာအမှတ်: EL-R / 03740

Date / နေ့စွဲ: 10 October, 2019

Laboratory Analysis Report /ဓာတ်ခွဲစစ်ဆေးမှုအစီအရင်ခံစာ

Sample Profileနမူနာရာဇဝင်

နမူနာအမည် /Sample Name	KLB - 3	နမူနာအမှတ်/ Sample ID	5714	
နေရာ (မြို့နယ်) Location (Township)	ကွမ်လုံ	လတ္တီတွဒ် Latitude	-	
နေရာ (တိုင်း/ပြည်နယ်) Location (Division/State)	ရှမ်းပြည်မြောက်ပိုင်း	လောင်ဂျီတွဒ် Longitude	-	
ပေးပို့သူအမည် Sender Name	Social & Environmental Associate Myanmar	နမူနာကောက်ယူချိန် (နေ့၊ နာရီ) Sampling Time (Date, Time)	1.10.2019	10:35 am
အဖွဲ့အစည်းOrganisation	-			
ဆက်သွယ်ရန် Contact	09978884840	နမူနာရောက်ရှိချိန် (နေ့၊ နာရီ) Arriving Time (Date, Time)	4.10.2019	-

(This laboratory analysis report is based solely on the sample submitted by the customer)

(ဤဓာတ်ခွဲစစ်ဆေးမှုအစီရင်ခံစာသည် ပေးပို့သူမပို့ဆောင်ခဲ့သည့်နမူနာကိုသာအခြေခံထားပါသည်။)

Water Sample Analysis Results for Oil & Grease ရေနမူနာစမ်းသပ်ချက် အဖြေ

စဉ် Sr.	အရည်အသွေးညွှန်းကိန်း Quality Parameter	ရလဒ် အဖြေ Results		နည်းစဉ် Method	သောက်ရေ စံနှုန်း Drinking Standard	စွန့်ပစ်ရေ စံနှုန်း Effluent Standard	မှတ်ချက် Remarks
၁	Oil & Grease	5	mg/L	Liquid-Liquid Pertition Gravimetric Method	-	≤10 mg/L *	Normal

* Myanmar Emission Guideline 2015 NG=No Guideline ND= Not Detected

စမ်းသပ်ပြီး Tested by	စစ်ဆေးပြီး Checked by	တာဝန်ခံApproved by
Zaw Winn Kyaw Assistant Technician (II) Ecological Laboratory ALARM	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory ALARM	Dr. Aye Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

A-2, Kan Street, Hlaing Township, 11051, Yangon, Myanmar. Tel: +95 1 503301 | Fax: +95 1 503302
Email: alarm.myanmar@gmail.com | website: www.myanmaraffairs.com

ပတ်ဝန်းကျင်ရေးရာဓာတ်ခွဲခန်း
Ecological Laboratory

စိမ်းလန်းအမိမြေဖွံ့ဖြိုးတိုးတက်ရေးအသင်း (Advancing Life and Regenerating Motherland, ALARM)

Reference Number/ စာအမှတ်: EL-R / 03741

Date / နေ့စွဲ: 16 October, 2019

Laboratory Analysis Report /ဓာတ်ခွဲစစ်ဆေးမှုအစီအရင်ခံစာ

Sample Profileနမူနာရာဇဝင်

နမူနာအမည် /Sample Name	KLB	နမူနာအမှတ်/ Sample ID	5715	
နေရာ (မြို့နယ်) Location (Township)	ကွမ်လုံ	လတ္တီတွဒ် Latitude	-	
နေရာ (တိုင်း/ပြည်နယ်) Location (Division/State)	ရှမ်းပြည်မြောက်ပိုင်း	လောင်ဂျီတွဒ် Longitude	-	
ပေးပို့သူအမည် Sender Name	Social & Environmental Associate Myanmar	နမူနာကောက်ယူချိန် (နေ့၊ နာရီ) Sampling Time (Date, Time)	1.10.2019	10:35 am
အဖွဲ့အစည်းOrganisation	-			
ဆက်သွယ်ရန် Contact	09978884840	နမူနာရောက်ရှိချိန် (နေ့၊ နာရီ) Arriving Time (Date, Time)	4.10.2019	-

(This laboratory analysis report is based solely on the sample submitted by the customer)

(ဤဓာတ်ခွဲစစ်ဆေးမှုအစီရင်ခံစာသည် ပေးပို့သူမှပို့ဆောင်ခဲ့သည့်နမူနာကိုသာအခြေခံထားပါသည်။)

Analysis Results စမ်းသပ်ချက်အဖြေ

စဉ် Sr.	အရည်အသွေးညွှန်းကိန်း Quality Parameter	ရလဒ် အဖြေ Results		နည်းစဉ် Method	စံသတ်မှတ်ချက် Drinking Standard	စွန့်ရေ စံနှုန်း Effluent Standard	မှတ်ချက် Remarks
1	ချဉ်ဖန်ကိန်း (pH)	8.1		HANNA HI 98129, 98130 Water Proof pH Tester (Electrode Method)	6.5 – 8.5	6.0 – 9.0 *	Normal
2	ဆိုင်းကြွအနယ် (TSS)	76	mg/L	Lovibond SpectroDirect Method No. 383	NG	≤50 mg/L *	Above the limit
3	ဇီဝဆိုင်ရာ အောက်ဆီဂျင်လိုအပ်ချက် (BOD_5)	4	mg/L	Estimated by Eco-Lab with Jenway Dissolved Oxygen Meter (Model 970)	≤ 3 mg/L	≤ 50 mg/L *	Above DW limit
4	ဓာတုဆိုင်ရာ အောက်ဆီဂျင်လိုအပ်ချက် (COD)	<30	mg/L	Lovibond SpectroDirect Method No. 130, 131, 132	NG	≤ 250 mg/L *	Normal
5	ဆိုင်ယမ်နိုက် (Free Cyanide)	<0.01	mg/L	Lovibond SpectroDirect Method No. 157	≤ 0.07 mg/L	≤ 0.1 mg/L *	Normal
6	မီးစုန်းဓာတ် (Phosphorous)	1.5	mg/L	Lovibond SpectroDirect Method No. 320, 321	NG	2 mg/L *	Normal
7	ခဲ သတ္တုဓါတ် (Lead)	ND	mg/L	AAS, Shimadzu AA-6200 Pb (283.3 nm)	≤ 0.01 mg/L	≤ 0.1 mg/L *	Lower limit of detection = 0.1mg/L
8	Total Nitrogen	<5	mg/L	Lovibond SpectroDirect Method No. 283	-	<10 mg/L	Normal

* Myanmar Emission Guideline 2015 NG=No Guideline ND= Not Detected

စမ်းသပ်ပြီး Tested by

Daw May Myat Khine
Lab. Technician II
Ecological Laboratory
ALARM

စစ်ဆေးပြီး Checked by

Daw Lin Myat Myat Aung
Lab. Technician I
Ecological Laboratory
ALARM

တာဝန်ခံApproved by

Dr. Aye Aye Win
Laboratory In-Charge
Ecological Laboratory
(ALARM)

A-2, Kan Street, Hlaing Township, 11051, Yangon, Myanmar. Tel: +95 1 503301 | Fax: +95 1 503302

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Ecological Laboratory

စိမ်းလန်းအမိမြေဖွံ့ဖြိုးတိုးတက်ရေးအသင်း (Advancing Life and Regenerating Motherland, ALARM)

Reference Number/ စာအမှတ်: EL-R / 03741

Date / နေ့စွဲ: 10 October, 2019

Laboratory Analysis Report /ဓာတ်ခွဲစစ်ဆေးမှုအစီအရင်ခံစာ

Sample Profileနမူနာရာဇဝင်

နမူနာအမည် /Sample Name	KLB	နမူနာအမှတ်/ Sample ID	5715	
နေရာ (မြို့နယ်) Location (Township)	ကွမ်လုံ	လတ္တီတွဒ် Latitude	-	
နေရာ (တိုင်း/ပြည်နယ်) Location (Division/State)	ရှမ်းပြည်မြောက်ပိုင်း	လောင်ဂျီတွဒ် Longitude	-	
ပေးပို့သူအမည် Sender Name	Social & Environmental Associate Myanmar	နမူနာကောက်ယူချိန် (နေ့၊ နာရီ) Sampling Time (Date, Time)	1.10.2019	10:35 am
အဖွဲ့အစည်းOrganisation	-			
ဆက်သွယ်ရန် Contact	09978884840	နမူနာရောက်ရှိချိန် (နေ့၊ နာရီ) Arriving Time (Date, Time)	4.10.2019	-

(This laboratory analysis report is based solely on the sample submitted by the customer)

(ဤဓာတ်ခွဲစစ်ဆေးမှုအစီရင်ခံစာသည် ပေးပို့သူမှပို့ဆောင်ခဲ့သည့်နမူနာကိုသာအခြေခံထားပါသည်။)

Water Sample Analysis Results for Oil & Grease ရေနမူနာစမ်းသပ်ချက် အဖြေ

စဉ် Sr.	အရည်အသွေးညွှန်းကိန်း Quality Parameter	ရလဒ် အဖြေ Results		နည်းစဉ် Method	သောက်ရေ စံနှုန်း Drinking Standard	စွန့်ပစ်ရေ စံနှုန်း Effluent Standard	မှတ်ချက် Remarks
၁	Oil & Grease	5	mg/L	Liquid-Liquid Pertition Gravimetric Method	-	≤10 mg/L *	Normal

* Myanmar Emission Guideline 2015 NG=No Guideline ND= Not Detected

စမ်းသပ်ပြီး Tested by	စစ်ဆေးပြီး Checked by	တာဝန်ခံApproved by
Zaw Winn Kyaw Assistant Technician (II) Ecological Laboratory ALARM	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory ALARM	Dr. Aye Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

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Email: alarm.myanmar@gmail.com | website: www.myanmaraffairs.com

ပတ်ဝန်းကျင်ရေးရာဓာတ်ခွဲခန်း
Ecological Laboratory

စိမ်းလန်းအမိမြေဖွံ့ဖြိုးတိုးတက်ရေးအသင်း (Advancing Life and Regenerating Motherland, ALARM)

Reference Number/ စာအမှတ်: EL-R / 03799

Date / နေ့စွဲ: 8 November, 2019

Laboratory Analysis Report /ဓာတ်ခွဲစစ်ဆေးမှုအစီအရင်ခံစာ

Sample Profileနမူနာရာဇဝင်

နမူနာအမည် /Sample Name	KBW	နမူနာအမှတ်/ Sample ID	5798	
နေရာ (မြို့နယ်) Location (Township)	Kunlong Tsp	လတ္တီတွဒ် Latitude	-	
နေရာ (တိုင်း/ပြည်နယ်) Location (Division/State)	Shan North	လောင်ဂျီတွဒ် Longitude	-	
ပေးပို့သူအမည် Sender Name	SEAM	နမူနာကောက်ယူချိန် (နေ့၊ နာရီ) Sampling Time (Date, Time)	27.10.2019	2:00 pm
အဖွဲ့အစည်းOrganisation	-			
ဆက်သွယ်ရန် Contact	09795834156	နမူနာရောက်ရှိချိန် (နေ့၊ နာရီ) Arriving Time (Date, Time)	31.10.2019	1:35 pm

(This laboratory analysis report is based solely on the sample submitted by the customer)

(ဤဓာတ်ခွဲစစ်ဆေးမှုအစီရင်ခံစာသည် ပေးပို့သူမှပို့ဆောင်ခဲ့သည့်နမူနာကိုသာအခြေခံထားပါသည်။)

Analysis Results စမ်းသပ်ချက်အဖြေ

စဉ် Sr.	အရည်အသွေးညွှန်းကိန်း Quality Parameter	ရလဒ် အဖြေ Results		နည်းစဉ် Method	စံသတ်မှတ်ချက် Drinking Standard	စွန့်ရေ စံနှုန်း Effluent Standard	မှတ်ချက် Remarks
1	ချဉ်ဖန်ကိန်း (pH)	7.6		HANNA HI 98129, 98130 Water Proof pH Tester (Electrode Method)	6.5 – 8.5	6.0 – 9.0 *	Normal
2	အပူချိန် (Temperature)	23	°C	Estimated by Eco-Lab with Jenway Dissolved Oxygen Meter (Model 970)	-	±3°C	-
3	အရောင် (Colour)	16	Pt-Co	Lovibond SpectroDirect Method No. 203	-	-	-
4	နောက်ကျိုမှု (Turbidity)	<5	FAU	Lovibond SpectroDirect Method No. 385	≤10 FAU	NG	Clear
5	ပျော်ဝင်အနည်များ (Total dissolved solids)	71	mg/L	HANNA HI 98129, 98130 Water Proof TDS Tester (Electrode Method)	NG	≤2000 mg/l *	Normal
6	ဆိုင်းကြွအနယ် (TSS)	3	mg/L	Lovibond SpectroDirect Method No. 383	NG	≤50 mg/L *	Normal
7	လျှပ်စီးကိန်း (Conductivity)	0.1	mS/cm	HANNA HI 98129, 98130 Water Proof EC Tester (Electrode Method)	≤2.5 mS/cm	NG	Normal
8	နိုက်ထြိုဒ် နိုက်ထရိုဂျင် (Nitrate-Nitrogen)	1.5	mg/L	Lovibond SpectroDirect Method No. 265,267	≤ 10 mg/L	NG	Normal
9	နိုက်ထြိုက် (Nitrite)	<0.03	mg/L	Lovibond SpectroDirect Method No. 270	≤ 3 mg/L	NG	Normal
10	Phosphate	24	mg/L	Lovibond SpectroDirect Method No. 320, 321	NG	NG	-

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Ecological Laboratory

စိမ်းလန်းအဓိမြေဖွံ့ဖြိုးတိုးတက်ရေးအသင်း (Advancing Life and Regenerating Motherland, ALARM)

11	ဓိန်ဓာတ် (Arsenic)	0	mg/L	Lovibond Arsenic test kit code.no -400700	≤ 0.01 mg/L	≤ 0.1 mg/L *	Normal
12	သံ သတ္တုဓာတ် (Iron)	<0.1	mg/L	Lovibond SpectroDirect Method No. 220	≤ 0.2 mg/L	≤ 3.5 mg/L *	Normal
13	ခဲ သတ္တုဓါတ် (Lead)	0.1	mg/L	AAS, Shimadzu AA-6200 Pb (283.3 nm)	≤ 0.01 mg/L	≤ 0.1 mg/L *	Above DW limit
14	သွပ် သတ္တုဓါတ် (Zinc)	0.03	mg/L	Lovibond SpectroDirect Method No. 400	-	≤ 2 mg/L *	Normal

* Myanmar Emission Guideline 2015 NG=No Guideline ND= Not Detected

စမ်းသပ်ပြီး Tested by

Daw Lin Myat Myat Aung
Lab. Technician I
Ecological Laboratory
ALARM

တာဝန်ခံApproved by

Dr. Aye Aye Win
Laboratory in-Charge
Ecological Laboratory
(ALARM)

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Ecological Laboratory

စိမ်းလန်းအမိမြေဖွံ့ဖြိုးတိုးတက်ရေးအသင်း (Advancing Life and Regenerating Motherland, ALARM)

Reference Number/ စာအမှတ်: EL (M)-R / 240

Date / နေ့စွဲ:5th November, 2019

Laboratory Analysis Report/ဓာတ်ခွဲစစ်ဆေးမှုအစီအရင်ခံစာ

Sample Profile နမူနာရာဇဝင်

နမူနာအမည် /Sample Name	KBW	နမူနာအမှတ် / Sample ID	240	
နေရာ (မြို့နယ်) Location (Township)	ကွမ်းလုံ(တံတားဦး)၊ကွမ်းလုံမြို့နယ်	လတ္တီတွဒ် Latitude		
နေရာ (တိုင်း/ပြည်နယ်) Location (Division/State)	ရှမ်းပြည်နယ်မြောက်ပိုင်း	လောင်ဂျီတွဒ် Longitude		
ပေးပို့သူအမည် Sender Name	SEAM	နမူနာကောက်ယူချိန် (နေ့၊ နာရီ) Sampling Time (Date, Time)	27.10.19	
အဖွဲ့အစည်းOrganisation	SEAM			
ဆက်သွယ်ရန် Contact		နမူနာရောက်ရှိချိန် (နေ့၊ နာရီ) Arriving Time (Date, Time)	31.10.19	

(This laboratory analysis report is based solely on the sample submitted by the customer)

(ဤဓာတ်ခွဲစစ်ဆေးမှုအစီရင်ခံစာသည် ပေးပို့သူမပို့ဆောင်ခဲ့သည့်နမူနာကိုသာအခြေခံထားပါသည်။)

Analysis Results စမ်းသပ်ချက်အဖြေ

စဉ် Sr.	အရည်အသွေးညွှန်းကိန်း Quality Parameter	ရလဒ် အဖြေ Results	နည်းစဉ် Method	စံသတ်မှတ်ချက် Drinking Standard	မှတ်ချက် Remarks
၁	Total plate count (CFU/ml)		Total plate count method	0	
၂	Total coliform count (MPN/100 ml) (Presemption test)		Most Probable Number method	0	
၃	Total faecal coliform count (MPN/100ml) (Presemption test)		Most Probable Number method	0	
၄	Total coliform count (CFU/ml) (Confirm test)		Eosin Methyl blue agar plate test	0	
၅	Complete test for coliform bacteria		Gram staining test	-	
၆	Total coliform count (CFU/ml)	760	3M Pate count method	0	
၇	Total *E.coli* count (CFU/ml)	0	3M Pate count method	0	

Note: Sample was submitted using customer arranged bottle. The target sample needs to test some additional tests to confirm total coliform and total faecal coliform.

စမ်းသပ်ပြီး	စစ်ဆေးပြီး	တာဝန်ခံ
Tested by	Check by	Approved by
Myat Nyein Khine Research Assistant ALARM	Sai Pyae Sone Aung Research Assistant ALARM	Dr. Nitar Nwe Research Scientist Ecological Laboratory ALARM

ISO TECH LABORATORY

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E(Delft) Lecturer of YIT (Retd). Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

ISO 9001:2015 Cert. No. 688600

WTL-RE-001
Issue Date - 01-1-2016
Effective Date - 01-1-2016
Issue No - 1.0/Page 1 of 1

M1019 007

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client: Social & Environmental Associates-Myanmar (SEAM)
Nature of Water: River Water (KLB - 1)
Location: Thanlwin River, North Shan State.
Date and Time of collection: 1.10.2019 (9:09 AM)
Date and Time of arrival at Laboratory: 4.10.2019
Date and Time of commencing examination: 4.10.2019
Date and Time of completing: 5.10.2019

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	30	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	8	CFU/100ml	Not detected
pH	8.3		6.5 - 8.5
Turbidity	99	NTU	5 NTU
Colour (True)	60	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

*** Collection Time and Sample Collect Bottle Error.**

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by

Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
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ISO TECH LABORATORY

ISO 9001:2015 Cert. No. 688600

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E(Delft) Lecturer of YIT (Retd). Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-1-2016
Effective Date - 01-1-2016
Issue No - 1.0/Page 1 of 1

M1019 008

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client: Social & Environmental Associates-Myanmar (SEAM)
Nature of Water: River Water (KLB - 2)
Location: Thanlwin River, North Shan State.
Date and Time of collection: 1.10.2019 (10:05 AM)
Date and Time of arrival at Laboratory: 4.10.2019
Date and Time of commencing examination: 4.10.2019
Date and Time of completing: 5.10.2019

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	44	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	12	CFU/100ml	Not detected
pH	8.2		6.5 - 8.5
Turbidity	122	NTU	5 NTU
Colour (True)	80	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

*** Collection Time and Sample Collect Bottle Error.**

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by

Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

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WTL-RE-001
Issue Date - 01-1-2016
Effective Date - 01-1-2016
Issue No - 1.0/Page 1 of 1

M1019 009

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client: Social & Environmental Associates-Myanmar (SEAM)
Nature of Water: River Water (KLB - 3)
Location: Thanlwin River, North Shan State.
Date and Time of collection: 1.10.2019 (10:35 AM)
Date and Time of arrival at Laboratory: 4.10.2019
Date and Time of commencing examination: 4.10.2019
Date and Time of completing: 5.10.2019

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	40	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	10	CFU/100ml	Not detected
pH	8.2		6.5 - 8.5
Turbidity	130	NTU	5 NTU
Colour (True)	80	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

*** Collection Time and Sample Collect Bottle Error.**

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by

Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
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Issue No - 1.0/Page 1 of 1

M1019 010

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client: Social & Environmental Associates-Myanmar (SEAM)
Nature of Water: River Water (KLB)
Location: Thanlwin River, North Shan State.
Date and Time of collection: 1.10.2019 (10:35 AM)
Date and Time of arrival at Laboratory: 4.10.2019
Date and Time of commencing examination: 4.10.2019
Date and Time of completing: 5.10.2019

Results of Water Analysis

WHO Drinking Water Guideline (Geneva - 1993)

Total Coliform Count	30	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	10	CFU/100ml	Not detected
pH	8.2		6.5 - 8.5
Turbidity	110	NTU	5 NTU
Colour (True)	70	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

*** Collection Time and Sample Collect Bottle Error.**

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by

Signature: Heinu
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
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Water Quality Laboratory Results- second season survey result

ISO TECH LABORATORY

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ISO 9001:2015 Cert. No. 688600

WTL-RE-001
Issue Date - 01-1-2016
Effective Date - 01-1-2016
Issue No - 1.0/Page 1 of 1

M1219 057

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	Social & Environmental Associates - Myanmar Co.,Lt
Nature of Water	River Water - KLB
Location	ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ ကွမ်းလုံမြို့နယ်၊ လားရှိုးမြို့။
Date and Time of collection	11.12.2019
Date and Time of arrival at Laboratory	13.12.2019
Date and Time of commencing examination	13.12.2019
Date and Time of completing	14.12.2019

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	20	CFU/100ml	Not detected *
Thermotolerant (fecal) Coliform Count	2	CFU/100ml	Not detected
pH	7.5		6.5 - 8.5
Turbidity	13	NTU	5 NTU
Colour (True)	5	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

*** Sample Collection And Date And Time Error.**

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by

Signature: Hein

Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:

Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

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WTL-RE-001
Issue Date - 01-1-2016
Effective Date - 01-1-2016
Issue No - 1.0/Page 1 of 1

M1219 058

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	Social & Environmental Associates - Myanmar Co.,Lt
Nature of Water	River Water - KLB (1)
Location	ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ ကွမ်းလုံမြို့နယ်၊ လားရှိုးမြို့။
Date and Time of collection	11.12.2019 (9:08 AM)
Date and Time of arrival at Laboratory	13.12.2019
Date and Time of commencing examination	13.12.2019
Date and Time of completing	14.12.2019

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	24	CFU/100ml	Not detected *
Thermotolerant (fecal) Coliform Count	2	CFU/100ml	Not detected
pH	7.7		6.5 - 8.5
Turbidity	15	NTU	5 NTU
Colour (True)	5	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

*** Sample Collection And Date And Time Error.**

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by

Signature: Hein

Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature: Soe Thit

Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18. Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-30339681, 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ISO TECH LABORATORY

ISO-TECH LABORATORY

ISO 9001:2015 Cert. No. 688600

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E(Delft) Lecturer of YIT (Retd). Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-1-2016
Effective Date - 01-1-2016
Issue No - 1.0/Page 1 of 1

M1219 059

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	Social & Environmental Associates - Myanmar Co.,Lt
Nature of Water	River Water - KLB (2)
Location	ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ ကွမ်းလုံမြို့နယ်၊ လားရှိုးမြို့။
Date and Time of collection	11.12.2019 (9:25 AM)
Date and Time of arrival at Laboratory	13.12.2019
Date and Time of commencing examination	13.12.2019
Date and Time of completing	14.12.2019

Results of Water Analysis

WHO Drinking Water Guideline (Geneva - 1993)

Total Coliform Count	24	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	2	CFU/100ml	Not detected
pH	7.6		6.5 - 8.5
Turbidity	16	NTU	5 NTU
Colour (True)	5	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

*** Sample Collection And Date And Time Error.**

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by

Signature: Heinz

Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature: Soe Thit

Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Lab. ...ory

(a division of WEG Co.,Ltd.)
No.18. Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-30339681, 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ISO TECH LABORATORY

ISO-TECH LABORATORY

ISO 9001:2015 Cert. No. 688600

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E(Delft) Lecturer of YIT (Retd). Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

M1219 060

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	Social & Environmental Associates - Myanmar Co.,Lt
Nature of Water	River Water - KLB (3)
Location	ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ ကွမ်းလုံမြို့နယ်၊ လားရှိုးမြို့။
Date and Time of collection	11.12.2019 (10:00 AM)
Date and Time of arrival at Laboratory	13.12.2019
Date and Time of commencing examination	13.12.2019
Date and Time of completing	14.12.2019

Results of Water Analysis

WHO Drinking Water Guideline (Geneva - 1993)

Total Coliform Count	18	CFU/100ml	Not detected.
Thermotolerant (fecal) Coliform Count	2	CFU/100ml	Not detected
pH	7.6		6.5 - 8.5
Turbidity	9	NTU	5 NTU
Colour (True)	5	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

*** Sample Collection And Date And Time Error.**

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by

Signature: Heinz

Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature: Soe Thit

Name: Soe Thit
B.E (Civil) 1980
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18. Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-30339681, 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ALARM Ecological Laboratory

Water Testing Result Report

Report Number : EL-WR / 03968 Date : December 20, 2019

Client Information

Client Name	:	Social & Environmental Associate Myanmar Co.Ltd
Organization	:	-
Client ID	:	-
Registration Date & Time	:	13.12.2019 ;
Contact	:	09795834156
Testing Purpose	:	For Standard

Sample Information

Sample ID	:	6034
Sample Name	:	KLB
Sample Type / Source	:	Natural
Sampling Date & Time	:	11.12.2019 ;
Sample Location	:	သံလွင်မြစ်ရေ၊ ကွမ်းလုံးမြို့၊ ရွှမ်းပြည်နယ်မြောက်ပိုင်း၊ လားရှိုးခရိုင်
Latitude	:	-
Longitude	:	-

Testing Results

This laboratory analysis report is based solely on the sample submitted by the client unless client took our sampling service.

This report shall not be reproduced except in full, without written approval of the laboratory

Sr.	Quality Parameters	Results	Units	Drinking Standards	Remarks
1	pH[1]	7.3	S.U	6.5 - 8.5[b]	Normal
2	TSS[3]	0	mg/L	-	-
3	BOD_5 [6]	3.3	mg/L	-	-
4	COD[3]	<30	mg/L	-	-
5	Free Cyanide[3]	0.01	mg/L	-	-
6	Phosphorous[3]	6.4	mg/L	-	-
7	Lead[7]	ND	mg/L	≤0.01 [a]	LOD = 0.1 mg/L
8	Total Nitrogen[3]	1.8	mg/L	-	-
9	Oil & Grease [9]	3	mg/L	-	-

"ND" = Not Detected "LOD" = Lower limit of detection " - " = No Reference Standard

Tested by	Checked by	Approved by
Daw May Myat Khine Lab. Technician II Ecological Laboratory ALARM	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory ALARM	Dr. Aye Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

Building A-2, Kan Street, Hlaing Tsp., Yangon. Tel: 01-503301, 01-503302, 09-407496078
Email: aelab@alarmmyanmar.org , websites: www.alarmmyanmar.org

ALARM Ecological Laboratory

Water Testing Result Report

Report Number : EL-WR / 03969 Date : December 20, 2019

Client Information

Client Name	:	Social & Environmental Associate Myanmar Co.Ltd
Organization	:	-
Client ID	:	-
Registration Date & Time	:	13.12.2019 ;
Contact	:	09795834156
Testing Purpose	:	For Standard

Sample Information

Sample ID	:	6035
Sample Name	:	KLB 1
Sample Type / Source	:	Natural
Sampling Date & Time	:	11.12.2019 ;
Sample Location	:	သံလွင်မြစ်ရေ၊ ကွမ်းလုံးမြို့၊ ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ လားရှိုးခရိုင်
Latitude	:	-
Longitude	:	-

Testing Results

This laboratory analysis report is based solely on the sample submitted by the client unless client took our sampling service.

This report shall not be reproduced except in full, without written approval of the laboratory

Sr.	Quality Parameters	Results	Units	Drinking Standards	Remarks
1	pH[1]	7.1	S.U	6.5 – 8.5[b]	Normal
2	TSS[3]	0	mg/L	-	-
3	BOD_5 [6]	3.5	mg/L	-	-
4	COD[3]	<30	mg/L	-	-
5	Free Cyanide[3]	0.01	mg/L	-	-
6	Phosphorous[3]	5.8	mg/L	-	-
7	Lead[7]	ND	mg/L	≤0.01 [a]	LOD = 0.1 mg/L
8	Total Nitrogen[3]	1.3	mg/L	-	-
9	Oil & Grease [9]	3	mg/L	-	-

"ND" = Not Detected "LOD" = Lower limit of detection " - " = No Reference Standard

Tested by	Checked by	Approved by
Daw May Myat Khine Lab. Technician II Ecological Laboratory ALARM	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory ALARM	Dr. Aye Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

Building A-2, Kan Street, Hlaing Tsp., Yangon. Tel: 01-503301, 01-503302, 09-407496078
Email: aelab@alarmmyanmar.org , websites: www.alarmmyanmar.org

ALARM Ecological Laboratory

Water Testing Result Report

Report Number : EL-WR / 03970 Date : December 20, 2019

Client Information

Client Name : Social & Environmental Associate Myanmar Co.Ltd
Organization : -
Client ID : -
Registration Date & Time : 13.12.2019 ;
Contact : 09795834156
Testing Purpose : For Standard

Sample Information

Sample ID : 6036
Sample Name : KLB 2
Sample Type / Source : Natural
Sampling Date & Time : 11.12.2019 ;
Sample Location : သံလွင်မြစ်ရေ၊ ကွမ်းလုံးမြို့၊ ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ လားရှိုးခရိုင်
Latitude : -
Longitude : -

Testing Results

This laboratory analysis report is based solely on the sample submitted by the client unless client took our sampling service.

This report shall not be reproduced except in full, without written approval of the laboratory

Sr.	Quality Parameters	Results	Units	Drinking Standards	Remarks
1	pH[1]	7.2	S.U	6.5 – 8.5[b]	Normal
2	TSS[3]	0	mg/L	-	-
3	BOD_5 [6]	4	mg/L	-	-
4	COD[3]	<30	mg/L	-	-
5	Free Cyanide[3]	<0.01	mg/L	-	-
6	Phosphorous[3]	0.4	mg/L	-	-
7	Lead[7]	ND	mg/L	≤0.01 [a]	LOD = 0.1 mg/L
8	Total Nitrogen[3]	<5	mg/L	-	-
9	Oil & Grease [9]	6	mg/L	-	-

"ND" = Not Detected "LOD" = Lower limit of detection " - " = No Reference Standard

Tested by	Checked by	Approved by
Daw May Myat Khine Lab. Technician II Ecological Laboratory ALARM	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory ALARM	Dr. Ave Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

Building A-2, Kan Street, Hlaing Tsp., Yangon. Tel: 01-503301, 01-503302, 09-407496078
Email: aelab@alarmmyanmar.org , websites: www.alarmmyanmar.org

ALARM Ecological Laboratory

Water Testing Result Report

Report Number : EL-WR / 03971 Date : December 20, 2019

Client Information

Client Name	:	Social & Environmental Associate Myanmar Co.Ltd
Organization	:	-
Client ID	:	-
Registration Date & Time	:	13.12.2019 ;
Contact	:	09795834156
Testing Purpose	:	For Standard

Sample Information

Sample ID	:	6037
Sample Name	:	KLB 3
Sample Type / Source	:	Natural
Sampling Date & Time	:	11.12.2019 ;
Sample Location	:	သံလွင်မြစ်ရေ၊ ကွမ်းပုံးမြို့၊ ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ လားရှိုးခရိုင်
Latitude	:	-
Longitude	:	-

Testing Results

This laboratory analysis report is based solely on the sample submitted by the client unless client took our sampling service.

This report shall not be reproduced except in full, without written approval of the laboratory

Sr.	Quality Parameters	Results	Units	Drinking Standards	Remarks
1	pH[1]	7	S.U	6.5 – 8.5[b]	Normal
2	TSS[3]	0	mg/L	-	-
3	BOD_5 [6]	3.1	mg/L	-	-
4	COD[3]	<30	mg/L	-	-
5	Free Cyanide[3]	<0.01	mg/L	-	-
6	Phosphorous[3]	4.2	mg/L	-	-
7	Lead[7]	ND	mg/L	≤0.01 [a]	LOD = 0.1 mg/L
8	Total Nitrogen[3]	<5	mg/L	-	-
9	Oil & Grease [9]	3	mg/L	-	-

"ND" = Not Detected "LOD" = Lower limit of detection " - " = No Reference Standard

Tested by	Checked by	Approved by
Daw May Myat Khine Lab. Technician II Ecological Laboratory ALARM	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory ALARM	Dr. Aye Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

Building A-2, Kan Street, Hlaing Tsp., Yangon. Tel: 01-503301, 01-503302, 09-407496078
Email: aelab@alarmmyanmar.org , websites: www.alarmmyanmar.org

11.12 List of Machinery, Equipment and Apparatus for China-AID Myanmar Kunlong Bridge Project

Annex 1. Second Batch of Machinery, Equipment and Apparatus for China-AID Myanmar Kunlong Bridge Project

S/N	Name of mechanical equipment	Specification	Quantity	Country of Origin	Application	Remarks
I	Earthwork and road building machinery					
1	Single steel wheel road roller		2Sets	China	Compact earthwork	Return to China after project completion
2	Excavator		1Set	Japan /China	Excavate and loading earthwork	
3	Excavator		1Set	Japan /China	Excavate and loading earthwork	
4	Excavator with breaking hammer		1Set	Japan /China	Excavate earthwork	
5	Wheel loader	XG955H	2Sets	China	Loading and unloading materials	
6	Wheel loader	XG953-III	1Set	China	Loading and unloading materials	
7	Motor grader		1Set	China	Smooth subgrade	
8	Frog rammer		5Sets	China	Backfill	
9	Compactor		5Sets	China	Subgrade construction	
II	Piling and drilling machinery					
1	Percussion drill		2Sets	China	Pile foundation construction	Return to China after project completion
2	Steel pipe pile hydraulic hammer		1Set	China	Pile foundation construction	
III	Lifting machinery, bridge machinery					
1	Truck crane	50t	1Set	China	Lift heavy goods	Return to China after project completion
2	Tower crane		2Sets	China	Lift heavy goods	
3	Bridge hanging basket		4Sets	China	Bridge construction	
4	Steel formwork (bearing platform, pier column, continuous steel structure)		700T	China	Bridge construction	

5	Plywood		1500Pcs	China	Bridge construction	Return to China after project completion
6	Scaffold		250T	China	Bridge construction	
7	Fastener		20000 Pcs	China	Bridge construction	
8	Three core electric-power lines of various specifications for production		2000M	China	Bridge construction	
IV	**Horizontal transport machinery**					
1	Dump truck		6Sets	China	Horizontal transport machinery	Return to China after project completion
2	Sprinkler truck		1Set	China	Horizontal transport machinery	
3	Concrete pump truck		1Set	China	Horizontal transport machinery	
4	Concrete pump		2Sets	China	Horizontal transport machinery	
5	Concrete mixer truck		3Sets	China	Horizontal transport machinery	
V	**Vertical transport machinery**					
1	Windlass	LIWEI JKL8AC	2Sets	China	Lift heavy goods	Return to China after project completion
		PENGWEI JKL-12	4Sets	China	Lift heavy goods	
VI	**Concrete and mortar machinery**					
1	Mortar mixer		10Sets	China	Mixing mortar	Return to China after project completion
2	Internal vibrator		30Sets	China	Vibrating concrete	
3	Plate vibrator		10Sets	China	Vibrating concrete	
4	Attached vibrator		10Sets	China	Vibrating concrete	
5	Prestressed tensioning equipment		2Sets		Prestressed tension	
6	Grouting machine		2Sets		Press in cement slurry	

VII	**Processing machinery**					
1	Woodworking circular sawing machine		2Sets	China		Return to China after project completion
2	Woodworking planer		2Sets	China		
3	Steel bar bending machine		4Sets	China		
4	Steel bar straightening machine		4Sets	China		
5	Sand blasting derusting machine		2Sets	China		
6	Reinforcing steel cutting machine		4Sets	China		
7	Straight thread steel bar threading machine		2Sets	China		
VIII	**Pump machinery**					
1	Submersible pump		10Sets	China		Return to China after project completion
2	Slurry pump		10Sets	China		
IX	**Welding machinery**					
1	Ac-dc welding machine		10Sets	China		Return to China after project completion
2	Oxygen welding equipment		4Sets	China		
3	Gas cutting equipment		4Sets	China		
4	Butt welding machine		4Sets	China		
5	Shearing machine		2Sets	China		
6	Rebar threading machine		3Sets	China		
X	**Power machinery**					
1	Diesel generator set	500KW	1Set	China		Return to China after project completion
2	Diesel generator set	300KW	1Set	China		
3	Diesel generator set	100KW	2Sets	China		
4	Diesel generator set	15KW	3Sets	China		
5	Rock drill	7655	6Sets	China		
6	Air compressor	L-12/8	6Sets	China		

XI	Pavement engineering machinery					
1	Pneumatic tyred roller	LRS235H	2Sets	China	Asphalt Pavement Construction	Return to China after project completion
2	Double-drum road roller	HD0120V	2Sets	China	Asphalt Pavement Construction	
3	Double-drum road roller	HD0128V	1Set	China	Asphalt Pavement Construction	
4	Road marking machine	Within 55Kw	1Set	China	Asphalt Pavement Construction	
5	Road line marker		1Set	China	Asphalt Pavement Construction	
6	Stabilized soil mixing plant	DWBS-600 (600t/h)	1Set	China	Asphalt Pavement Construction	
7	Asphalt concrete mixing plant		1Set	China	Asphalt Pavement Construction	
8	Multifunctional Paver		1Set	China	Asphalt Pavement Construction	
9	Intelligent asphalt spreader truck		1Set	China	Asphalt Pavement Construction	
10	Grooving machine	XW70	1Set	China	Asphalt Pavement Construction	
11	Asphalt dumping machine	LT15	1Set	China	Asphalt Pavement Construction	
12	Slurry seal vehicle	BREINING SP8000S	1Set	Germany	Asphalt Pavement Construction	
13	Synchronous detritus sealer truck	HGY5317TFCST	1Set	China	Asphalt Pavement Construction	

11.13 List of Compensation for Land Acquisition and Recorded Photos

a. Compensation Lists

၁။ ကွမ်းလုံတံတားသစ် တည်ဆောက်ခြင်း စီမံကိန်းလုပ်ငန်းအတွက် တံတားချဉ်းကပ်လမ်း နှင့် မြို့တွင်းလမ်းဧရိယာအတွင်းပါဝင်သည့်တောင်သူဦးရေ၊ မြေယာ၊ သီးနှံလျော်ကြေးစားရင်း (သိန်း ဘက်ခြမ်း) (လျော်ကြေးပေးပြီးစာရင်း)

မြေကွက်နံပါတ်	တောင်သူအမည်	သိမ်းယူမည့်ဧရိယာ	သီးနှံအမည်	အပင်အရေအတွက်
၁။	ဦးရန်တယ်ဟွာ	၀.၈၉၉	ရာဘာ	၇၈
၂။	ဦးရင်ယုံဂူ	၁.၄၄၈	ရာဘာ	၁၅၈
၃။	ဦးဟွေ့ကျုံး	၁.၁၈၄	ရာဘာ	၁၈၆
၄။	ဦးဝမ်းဟိုက်ချင်	၁.၃၇၃	ရာဘာ	၂၁၅
၅။	ဦးဖုန်ရှောက်ဖီး	၁.၀၀၃	ရာဘာ	၂၀၅
၆။	ဦးတင်အောင်	၀.၆၃၇	ရာဘာ	၁၄၅
၇။	ဦးကျန်ဖီး	၀.၆၂၃	ရာဘာ	၁၅၅
၈။	ဦးရန်နိုင်	၁.၃၁၃	ရာဘာ	၆၀
	စုစုပေါင်း	**၈.၄၇၁**		

၂။ ကွမ်းလုံတံတားသစ် တည်ဆောက်ခြင်း စီမံကိန်းလုပ်ငန်းအတွက် တံတားချဉ်းကပ်လမ်း နှင့် မြို့တွင်းလမ်းဧရိယာအတွင်းပါဝင်သည့်တောင်သူဦးရေ မြေယာ၊ သီးနှံလျော်ကြေးစားရင်း (ကွမ်းလုံဘက်ခြမ်း) (လျော်ကြေးပေးပြီးစာရင်း)

မြေကွက်နံပါတ်	တောင်သူအမည်	ဦးဝိုင်အမှတ်	သိမ်းယူမည့်ဧရိယာ(ဧက)	သီးနှံအမည်	အပင်အရေအတွက်
၉။	ဦးကြူလုံဖူ		၀.၁၄၂	လိုင်ချိုး, ပိန္နဲ,ဝါး	၃၃၂၅
၁၀။	ဦးကြူရှောက်ချောင်		၀.၃၉၈	လိုင်ချိုး, ဝါး	၈၁၄၀
၁၁။	ဦးကြူရှောက်ချောင်		၀.၃၀၆	ရာဘာ	၆၁
၁၂။	ဦးဟော်ရှောက်ရန်း	၁၃၂	၆.၄၂၁	ရာဘာ ကော်ဖီ	၉၉၆ ၁၉၉၆၀
၁၃။	ဦးဟော်စီး		၀.၄၆၉	လိုင်ချိုး	၁၀
၁၄။	ဦးလီလောက်ဂူ	၂၈	၀.၄၇၈	ရာဘာ လိုင်ချိုး	၉၅၂၅
	စုစုပေါင်း		**၈.၂၁၄**		

၃။ ကွမ်းလုံတံတားသစ်၏ လုပ်ငန်းခွင်ဧရိယာအတွင်း ပါဝင်သည့် တောင်သူဦးရေ၊ အပင်လျော်ကြေးနှင့် မြေငှားရမ်းခစာရင်း (လျော်ကြေးပေးပြီးစာရင်း)

စဉ်	တောင်သူအမည်	မြေအမျိုးအစား	ငှားရမ်းမည့်မြေဧရိယာ (ဧက)	သီးနှံအမည်	အပင်အရေအတွက်
၁။	ဦးလော်ကွမ်းတူ	ယာမြေ	၀.၃၂	ရာဘာ	၇၅
၂။	ဦးကျူကွမ်းလင်	ယာမြေ	၀.၆၅	ရာဘာ	၁၄၈
၃။	ဦးကျူလုံဖူ	ယာမြေ	၀.၆၅	ရာဘာ	၁၂၀
၄။	ဦးကျူရှောက်ချောင်	ယာမြေ	၀.၄၀	ရာဘာ	၉၉
၅။	ဦးဟော်ရှောက်ချန်း	ယာမြေ	၆.၄၇	ရာဘာ	၁၂၄၈
				ကော်ဖီ	၄၂
	စုစုပေါင်း		**၈.၄၉**		

b. Recorded Photos for delivering the compensation to the affected persons