TAUNGUP

TOWNSHIP ENVIRONMENTAL ASSESSMENT

2016

MYANMAR ENVIRONMENT INSTITUTE

BRACED Building Resilience and Adaptation to Climate Extremes and Disasters

MEI

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

Abbreviation and Acronyms

ADB	Asia Development Bank
BRACED	Building Resilience and Adaptation to Climate Extremes and Disasters
CBO	Community Based Organization
CRA	Community Risk Assessment
CSRA	Climate Resilient Sustainable Agriculture
CSO	Civil Society Organization
CSR	Corporate Social Responsibility
ECD	Environmental Conservation Department
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
IEE	Initial Environmental Examination
IFC	International Finance Corporation
KBA	Key Biodiversity Area
Km	Kilo Meter
MEI	Myanmar Environment Institute
MIMU	Myanmar Information and Management Unit
MOECAF	Ministry of Environmental Conservation and Forestry
MONREC	Ministry of Natural Resource and Environmental Conservation
NCEA	National Commission for Environmental Affair
NGO	Non-Governmental Organization
NTFP	Non -Timber Forest Product
PVC	Poly Vinyl Chloride
RIMES	Regional Integrated Multi -Hazard Early Warning System
SEA	Strategic Environmental Assessment
TDMP	Township Disaster Management Plan
TEA	Township environmental assessment
WFF	World Wildlife Fund

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Executive Summary

Introduction and Background

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

As a part of full BRACED project (2015-2017), MEI has committed to undertake eight TEA report for eight townwhips namely Taungup, Kyaukpyu, Kengtung, Meiktila, Dagon Myothit (Seikkan), Mawlamyine, Hpa-An and Labutta. All TEA reports focus on township level plans and economic developments related to that administrative boundary and provide recommendations for decision makers to apply in the planning process that incorporates environmental and social concerns. It furthermore allows for improved awareness of the environment in future planning process. This data will further help to identify potential environmental changes and impacts on communities that might impact on capacities of vulnerabilities within communities.

Environmental Legislative Framework & Enabling Environment for SEA

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

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

Hence, according to existing environmental regulations, there is not strong and mandatory requirement for conducting SEA.

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

Environmental Scoping

The preliminary scoping study was conducted stakeholder consultation meetings in Taungup Township. Opinion and suggestion from key stakeholders involved in consultation meetings were reflected in the scoping study along with finding from a literature review.

Key environmental issues preliminary identified are terrestrial and mangrove deforestation, waste disposal, water quality degradation, land cover change and human health.

This study will assess different sectors/areas to identify potential environmental considerations sush as

- Forest Types and Biodiversity
- Urban and Village Extension , Road Network
- Deforestation Activities
- Waste Management

Environmental Baseline

Taungup is situated in the western coastal region of Myanmar and administratively under Rakhine Region and Thandwe District.

The eastern three-fourths of the Taungup Township is hilly of RakhineYoma. To the west lies the narrow coastal lowland. The mangrove forest is situated between the lowland and the sea, occupying one-fifth of the township area. The extreme length from north to south is 49.083 miles (79 kilometers) and the extreme breadth from east to west is 21.7 miles. .

The Taungup creek, one of the major streams, originates over the Rakhine Yoma and flows westward into the Bay of Bengal after crossing the mangrove tidal flat. The Thinganet creek and its tributaries join the river from the south and the Pattaya, Kanyindaing and Zalonma creeks from the north.

Taungup experiences a number of different climates including high temperature and abundant rainfall. Varying elevations, geology and soil type result in a highly dispersed and diverse plant species.Existing forest can be classified as below.

1) Evergreen forest
2) Mixed deciduous forest
3) Coastal rain forest
4) Mangrove forest

Taungup Township is made up of a variety different ecosystems and natural features including primary forest, secondary woodland, scrub lands, active agricultural land, orchard land, human habitation area, mangrove forest and tidal rivers etc.

2014, total population of Taungup Township (including Ma Ei Sub Township) is 158341 with 77,257 males and 81,084 females. The population in Taungup Township is mainly distributed in the lowland area of watershed where fisheres and agriculture are practiced together.

The majority of the people who live in Taungup are Rakhine. Other ethic includes Bamar and Chin etc. There are over 80 per cent of total population of Taungup where settled in the low lying village tracts. Chin ranks second next to Rakhine in total number. They live in cluster on the spurs of Rakhine Yoma in the eastern part of Taungup. Most of the rural people in upland area are Chin ethnic people practicing their age-old traditional shifting cultivation with their indigenous technology knowledge. Most of the local people in Taungup Township are Buddhists.

Environmental Impact Analysis, Key vulnerabilities of communities in Taungup and Ecosystem Services

Both rural and urban communities have been experiencing a wide range of natural disasters such as flood, storm, river bank erosion and landslide. These natural disasters are exacerbated by environmental impacts by aqua faming and mangrove deforestation, logging, shifting cultivation and waste management.

Some environmental impacts triggered by development and other human activities are identified as *disruption to ecosystem service, land cover change, water pollution and deforestation. These* environmental effects could post significant threats to vulnerable communities of region.

Generic Recommendation and Environmental Management

This report provides recommendations for measures which should be integrated into existing and future township decision making process so as to improve environmental protection and to maintain ecosystem service of region.

Government

1. Existing environmental and related regulations and laws highlighted in chapter 2 of this report should be reviewed by local government departments and enforcement measures established including identification of responsible agencies and departments
2. Establish and convene a joint environmental working committee within township and regional level government structures to agree and adopt and implement an environmental management framework , oversee enforcement of laws and regulations and develop monitoring mechanism to monitor progress in tackling environmental and social issues
3. Promote community environmental awareness campaign highlighting the

importance of ecosystem services and its relation to community resilience

4. Township waste management plan should be developed including a sustainable waste management campaign, design and development of waste collection and storage facilities and disposal plans. This waste management plan should be in line with National Waste Management Strategy.
5. Increase capacity building of staff from relevant departments for enforcement and implementation of environmental legislations and guidance
6. Encourage industry and business to initiate transparency and information disclosure about their activities and services which are likely to impact on environment and community resilience
7. Improve capacity of staff for inspection and monitoring of environmental performance of business activities
8. Township departments and regional department should review both TEA impact section and Community Resilience Assessment Reports produced under BRACED to identify climate change and disaster shocks and stresses and further impacts caused by ongoing development activities. Activities identified by communities should be consolidated and plans drawn up for broader processes to enhance the resilience of most vulnerable communities of Taungup. These can include maintenance and improvement of ecosystem service of natural biodiversity by channeling small grants and funds to joint community and government environment and ecosystem management projects
9. Township Disaster Management Plan (TDMP) for Taungup should draw on data, information and risked identified in this report and ensure TDMP synergize with this report
10. Baseline data for water quality from Taungup Chaung and air quality should be collected to serve as basic reference

Industry and Business

11. Improvement in public participation and consultation in project development phase of new projects and activities
12. Initiate transparency and openness about project and business operations with publication of environmental, health and safety standards and policies.
13. Share information and findings of how businesses activities will affect community services and systems (food, water, energy, health etc.) and their resilience to climate extremes and environment and establish a mitigation plans
14. Encourage business investment in service provision and business practices that will improve the availability of resilience services to communities that will also

contribute to economic development and profit margins (e,g agricultural services, community infrastructure, energy and water services etc)

15. Development community health and safety initiatives along with occupation health and safety program
16. Prioritize environmental conservation and pollution prevention mechanisms in business operations
17. Develop project specific environmental management framework with local government departments and implementation in accordance with existing EIA guidance and laws
18. Adopt environmental training program to operatives to ensure the service and activities undertaken by business do not adversely affect the resilience of local communities and the environment
19. Initiate Corporate Social Responsibility programs focusing on enhancement of community resilience, protection of ecosystem service and environmental management

Recommendations for Community and Civil Society

20. Actively participate in stakeholder consultation and business meetings
21. Share local knowledge and experience in the consultation meeting and express concerns and challenges
22. Actively participate in environmental campaigns to be initiated by government organization and other organizations
23. Develop a private sector oversight mechanism that tracks adherence to environmental laws and procedures of all new development activities and projects
24. Oversee implementation of EMP and work to encourage accountability and transparency in business and development practices

အကျဉ်းချုပ် အစီရင်ခံချက်

မြန်မာ့ပတ်ဂန်းကျင်သိပ္ပံသည် အစွန်းရောက် ရာသီဥတုများ၏ ဘေးဒဏ်ခံနိုင်စွမ်း တည်ဆောက်ခြင်း နှင့် လိုက်လျောညီထွေ စွာနေထိုင်ခြင်း (BRACED) စီမံကိန်း၏ အစိတ်အပိုင်းတစ်ရပ်အဖြစ် မြန်မာနိုင်ငံအတွင်း ရွေးချယ်ထားသော မြို့နယ်(၈)မြို့နယ်တွင် ဗျူဟာမြောက် ပတ်ဂန်းကျင်ဆိုင်ရာ ဆန်းစစ်ခြင်း ပြုလုပ်ရန် တာဂန်ယူခဲ့ပါသည်။ BRACED စီမံကိန်းသည် ရွေးချယ်ထားသော မြို့နယ်ရှစ်မြို့နယ်အတွင်း လူဦးရေ သုံးသိန်းငါးသောင်းကျော် တို့တွင် အစွန်းရောက် ရာသီဥတုများကြောင့်ဖြစ်ပေါ်သော သဘာဂဘေးဒဏ် ခံနိုင်စွမ်း တည်ဆောက် ရန် ရည်မှန်းထားပါသည်။

BRACED စီမံကိန်းကာလ(၂၀၁၅-၂၀၁၇)အတွင်း ရွေးချယ်ထားသော တောင်ကုတ် ၊ဘားအံ၊မော်လမြိုင်၊ကျောက်ဖြူ၊ လပွတ္တာ၊မိတ္ထီလာ၊ကျိုင်းတုံနှင့် ဒဂုံမြို့သစ်(ဆိပ်ကမ်း) မြို့နယ် များအတွက် မြန်မာ့ပတ်ဝန်းကျင်သိပ္ပံမှာ မြို့နယ်ပတ်ဝန်းကျင် ဆန်းစစ်လေ့လာမှုများ ပြုလုပ်လျက် ရှိပါသည်။

အားလုံးသော ပတ်ဝန်းကျင်ဆိုင်ရာ ဆန်းစစ်ခြင်း အစီရင်ခံစာများသည် မြို့နယ်အတွင်း လုပ်ဆောင်နေသော ဖွံ့ဖြိုးရေး စီမံကိန်းများနှင့် အခြားသော လုပ်ငန်းစဉ် များကြောင့် ဖြစ်ပေါ်လျက်ရှိသော ပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာ ဆိုးကျိုး သက်ရောက်မှုများကို အဓိကထား လေ့လာပါသည်။ အစီရင်ခံစာမှ ထွက်ရှိလာသော အကြံပြုချက်များကို လက်ရှိနှင့် အနာဂတ် တွင် ဖြစ်ပေါ်လာနိုင်သော စီမံကိန်းများစီမံချက်များ တွင် ထည့်သွင်းစဉ်းစား နိုင်ရန် တင်ပြထားပါသည်။ အနာဂတ်စီမံကိန်းများ စီမံချက်များ ရေးဆွဲရာတွင်လည်း ပတ်ဝန်းကျင်ဆိုင်ရာ အသိအမြင်များ ပေါင်းစပ်၍ ထည့်သွင်း အသုံးပြုနိုင်မည် ဖြစ်ပါသည်။

ဤအစီအရင်ခံစာပါ အချက်အလက်များသည် ဒေသခံပြည်သူလူထု အစုအဖွဲများ၏ ဒဏ်ခံနိုင်စွမ်း ကို ထိပါးသွားနိုင်သော ပတ်ဝန်းကျင်ဆိုင်ရာ ဆိုးကျိုးသက်ရောက်မှုများကို ဖော်ထုတ်ပြီး မြို့နယ်ဆိုင်ရာ ဖွံ့ဖြိုးရေးနှင့်အခြား စီမံချက်များအတွက် လိုအပ်နေသော ပတ်ဝန်းကျင်ဆိုင်ရာ အခြေခံ လမ်းညွှန်ချက်တစ်ရပ် ဖြစ်လာစေရန် ရည်မှန်းထားပါသည်။

ပတ်ဝန်းကျင်ဆိုင်ရာ ဥပဒေ မူဘောင်

၂၀၁၅ ခုနှစ်တွင် ပြဋ္ဌာန်းထားသော ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း လုပ်ထုံးလုပ်နည်း အခန်း (၁၂) အပိုဒ် (၁၀) တွင် ဗျူဟာမြောက် ပတ်ဝန်းကျင်ဆိုင်ရာ လေ့လာဆန်းစစ်ခြင်းနှင့် ပတ်သတ်၍ ထည့်သွင်းဖော်ပြထားပါသည်။ သယံဇာတနှင့်ပတ်ဝန်းကျင်ဆိုင်ရာ ဝန်ကြီးဌာနသည် လိုအပ်ပါက အခြားဝန်ကြီးဌာနများ၊ ပြည်နယ်နှင့်တိုင်း ဒေသကြီးများ ၊ခရိုင်နှင့်မြို့နယ်များ၊ ကိုယ်ပိုင်အုပ်ချုပ်ခွင့်ရ တိုင်းဒေသများနှင့် အခြား ပုဂ္ဂလိက အဖွဲ့အစည်းများမှ ရေးဆွဲသော မူဝါဒများ၊ဗျူဟာများ၊ဖွံ့ဖြိုးရေးစီမံချက်များ အတွက် ဗျူဟာမြောက်ပတ်ဝန်းကျင်ဆိုင်ရာ အစီရင်ခံစာပြုစုရန် သက်ဆိုင်ရာ တာဝန်ရှိသူများကို တောင်းဆိုမည်ဖြစ်ပါသည်။

အကယ်၍ ထိုမူဝါဒများ၊ဗျူဟာများ၊ဖွံ့ဖြိုးရေးစီမံကိန်းနှင့်မူဘောင်များ၊စီမံချက်များမှ ပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုများ ရှိနိုင်သည်ဟု ယူဆပါက သက်ရောက်မှုများကို ဖော်ထုတ်နိုင်ရန်၊သင့်တော်သော လေ့လာဆန်းစစ်မှုများ ပြုလုပ်နိုင်ရန်၊ မဟာဗျူဟာမြောက် ပတ်ဝန်းကျင်အစီရင်ခံစာတွင် လေ့လာစောင့်ကြည့်ရေး မူဘောင်များ ထည့်သွင်းရေးဆွဲရန် တောင်းဆိုနိုင်ကြောင်း ဖော်ပြထားပါသည်။

ဤ လုပ်ထုံးလုပ်နည်းကို ပြန်လည်သုံးသပ်ကြည့်ပါက မဟာဗျူဟာမြောက်ပတ်ဝန်းကျင် ဆန်းစစ်ခြင်း အစီရင်ခံစာ နှင့်ပတ်သတ်၍ ယေဘုယျသာ ဖော်ပြထားသည်ကို တွေ့ရှိရပါသည်။ မည်သို့လိုအပ်သည် မည်သို့လုပ်ဆောင်ရမည်ဟု အသေးစိတ် ဖော်ပြထားနိုင်ခြင်း မရှိသလို မည်သို့ဆက်လက် ဆောင်ရွက်မည်ဟုလည်း ဖော်ပြနိုင်ခြင်း မရှိပါ။ ယေဘုယျအားဖြင့် ဗျူဟာမြောက်ပတ်ဝန်းကျင်ဆိုင်ရာ ဆန်းစစ်ခြင်းလုပ်ငန်းကို အစိုးရ သို့မဟုတ် အစိုးရက တာဝန်ပေးထားသော အဖွဲ့အစည်းမှသာ လုပ်ဆောင်လေ့ ရှိပါသည်။

ထို့ကြောင့်တည်ဆဲဥပဒေများအရ မဟာဗျူဟာမြောက် ပတ်ဝန်းကျင်ဆိုင်ရာ ဆန်းစစ်ခြင်း အစီရင်ခံစာ ပြုလုပ်ရန် ဥပဒေအရ လိုအပ်ချက်များ နည်းပါးနေကြောင်း တွေ့ရှိရပါသည်။

ယခုအစီရင်ခံစာသည် လက်ရှိ ပတ်ဝန်းကျင် သက်ရောက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း မှ ဖော်ပြထားသော အစိုးရ၏ စီးပွားရေးဖွံ့ဖြိုးတိုးတက်မှု စီမံချက်များ မူဝါဒများအတွက် ဗျူဟာမြောက်ပတ်ဝန်းကျင်ဆိုင်ရာ ဆန်းစစ်ခြင်း လိုအပ်ချက်ကို ဖြည့်ဆည်းရန်သို့မဟုတ် အစားထိုးရန် ရည်ရွယ်ခြင်းမဟုတ်ပါ။ ဒေသ အခြေအနေနှင့် ပတ်သတ်၍

ဖော်ပြထားသော အချက်အလက်များကို နောင်တွင် ပြုလုပ်မည့် ပတ်ဂန်းကျင်ဆိုင်ရာ လေ့လာမှုများအတွက် အသုံးပြုနိုင်ရန် သို့မဟုတ် အထောက်အကူပြုရန်သာ ရည်ရွယ်ပါသည်။

နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်း

တောင်ကုတ်မြို့နယ်အတွင်း သက်ဆိုင်သူ ဆက်စပ်ပတ်သတ်သူများနှင့် အစည်းအဝေးလုပ်ခြင်း နှင့် ပြင်ပစာတမ်းများ လေ့လာခြင်းတို့ ဖြင့် ပတ်ဂန်းကျင်ဆိုင်ရာ နယ်ပယ်အတိုင်းအတာ သတ်မှတ်ခြင်းကို ဆောင်ရွက်ခဲ့ပါသည်။ တက်ရောက်သူများ၏ အကြံပြုချက်များကိုလည်း ဤလေ့လာမှုတွင် ထည့်သွင်းထားပါသည်။

ရွေးချယ်ထားသော လေ့လာစရာ ပတ်ဂန်းကျင်အစိတ်အပိုင်းများနှင့် ပတ်ဂန်းကျင်ထိခိုက်နိုင်သော လုပ်ငန်းများကို အောက်ပါအတိုင်းရွေးချယ်ထားပါသည်။

- သစ်တော အမျိုးအစားများ နှင့် ဇီဂမျိုးစုံမျိုးကွဲများ
- မြို့ပြနှင့်ကျေးရွာများ ချဲ့ထွင်ခြင်း၊လမ်းများဖောက်လုပ်ခြင်း
- သစ်တောများပြုန်းတီးစေသောလုပ်ရပ်များ
- စွန့်ပစ်အမှိုက်များစီမံခန့်ခွဲမှု
- ဒီရေရောက်သစ်တောများ

ပတ်ဂန်းကျင်ဆိုင်ရာ အခြေခံအချက်အလက်များ

တောင်ကုတ်မြို့သည် ရခိုင်ပြည်နယ် သံတွဲခရိုင်အတွင်းတည်ရှိပြီး မြန်မာနိုင်ငံအနောက်ပိုင်း ပင်လယ်ကမ်းခြေ ဒေသလည်း ဖြစ်ပါသည်။ မြို့နယ်၏ အရှေ့ပိုင်းလေးပုံသုံးပုံသည် ရခိုင်ရိုးမ၏ အစိတ်အပိုင်း တောင်ကုန်း တောင်တန်းများ ဖြစ်ပါသည်။ အနောက်ဘက်တွင် ကမ်းရိုးတန်းဒေသ ရှိပြီး ဒီရေရောက်သစ်တောများက ကုန်းနိမ့်ပိုင်းနှင့် ပင်လယ်အကြားတွင် ပေါက်ရောက် နေပါသည်။ မြို့နယ်တခုလုံး၏ ငါးပုံတစ်ပုံမှာ ဒီရေရောက် သစ်တောများ ပေါက်ရောက်ရာ နေရာများ ဖြစ်ပါသည်။ တောင်မြောက်အရှည်မှာ (၄၉) မိုင်ရှိပြီး အရှေ့အနောက်အကျယ်အဂန်းမှာ ၂၁.၇မိုင်ရှိပါသည်။

အဓိကမြစ်မှာ တောင်ကုတ်ချောင်းဖြစ်ပြီး ရခိုင်ရိုးမကို မြစ်ဖျားခံကာ အနောက်ဘက်သို့ စီးဆင်းပါသည်။ ဒီရေတော လတာများကို ဖြတ်သန်းပြီး ဘင်္ဂလားပင်လယ်အော်ထဲသို့ စီးဆင်းပါသည်။

တောင်ကုတ်မြို့သည် မိုးရေချိန်များပြားခြင်း၊ရာသီဥတုပူပြင်းခြင်း စသည်ဖြင့် အမျိုးမျိုးသော ရာသီဥတု ကွဲပြားမှုများ ဖြစ်ပေါ်နေသော နေရာဖြစ်ပါသည်။ မြေမျက်နှာပြင် အနိမ့်အမြင့်၊ ဘူမိရုပ်သွင် အနေအထားနှင့် မြေဆီလွှာ အနေအထား တို့ကြောင့် အမျိုးအစားစုံလင်ပြီး ထူထပ်သောသစ်တောများ ပေါက်ရောက် နေခြင်းဖြစ်ပါသည်။ တည်ရှိနေသော သစ်တောများကို အမြဲစိမ်းသစ်တော၊ ရွက်ပြတ်သစ်တော၊ ကမ်းရိုးတန်း မိုးသစ်တောနှင့် ဒီရေရောက်သစ်တောများဟူ၍ ခွဲခြားထားပါသည်။

ဒေသအတွင်း မူလသစ်တောများ၊ ချုံနွယ်ပိတ်ပေါင်းများ၊ လယ်ယာမြေများ၊ ခြံများ၊ လူနေအိမ်ခြေများ၊ ဒီရေရောက် သစ်တောများ နှင့် ဒီရေဝင် မြစ်ချောင်းများစသည်ဖြင့် အမျိုးအစား စုံလင်သော ဂေဟစနစ်များ၊ မြေပြင်အနေအထားများ တည်ရှိနေပါသည်။

မအီမြိုနယ်ခွဲအပါအဝင် တောင်ကုတ်မြို့နယ်လူဦးရေမှာ ၂၀၁၄ ခုနှစ်သန်းခေါင်စာရင်းအရ စုစုပေါင်း (၁၅၈,၃၄၁) ဖြစ်ပြီး အမျိုးသား (၇၇,၂၅၇) နှင့်အမျိုးသမီး (၈၁,၀၈၁) ယောက်ဖြစ်ပါသည်။ မြို့နယ်လူဦးရေ၏ ၈၀ရာခိုင်နှုန်းမှာ မြေပြန့်ဒေသများတွင် နေထိုင်ကြပါသည်။ ရခိုင် လူမျိုးအများစုဖြစ်ပြီး ချင်းလူမျိုးများက ဒုတိယအများဆုံးဖြစ်ပါသည်။ ချင်းလူမျိုးများသည် မြို့နယ်အရှေ့ပိုင်း ရခိုင်ရိုးမ တောင်စွယ်တောင်တန်းများပေါ်တွင် နေထိုင်ကြပါသည်။ တောင်တန်းဒေသများတွင် နေထိုင်ကြသူ ချင်းလူမျိုးများသည် ရှိရင်းစွဲမိရိုးဖလာ နည်းလမ်းများဖြင့် ရွှေပြောင်း တောင်ယာစနစ်ကို ကျင့်သုံးလျက်ရှိကြပါသည်။ တောင်ကုတ်မြို့နယ်တွင် နေထိုင်သူအများစုမှာ ဗုဒ္ဓဘာသာကို ကိုးကွယ်ကြပါသည်။

ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုဆန်းစစ်ခြင်း၊ စိုရိမ်ဘွယ်ရာများနှင့် အင်အားအနည်းပါးဆုံး အစုအဖွဲများ

ဒေသအတွင်းရှိ ကျေးလက်နှင့်မြို့ပြ ဒေသခံပြည်သူများ အနေနှင့် ရေကြီးခြင်း၊ မုန်တိုင်းတိုက်ခြင်း ၊မြစ်ချောင်းကမ်းပါးပြိုခြင်းနှင့် မြေပြိုခြင်းများ အစရှိသော သဘာဝ ဘေးအန္တရာယ်ဆိုးများကို အမြဲကြုံတွေ့ရလျက်ရှိပါသည်။ ငါးပုဖွန် မွေးမြူခြင်းကြောင့် ဒီရေရောက် လမုတောများပျက်စီးခြင်း၊ သစ်ခုတ်ခြင်း၊ ရွှေပြောင်းတောင်ယာလုပ်ငန်းနှင့် အမှိုက်များစည်းမဲ့ကမ်းမဲ့ ပစ်လွှတ်ခြင်းများမှ ဖြစ်ပေါ်လာသော ပတ်ဝန်းကျင်ဆိုင်ရာ ဆိုးကျိုး သက်ရောက်မှုများကလည်း ဤသဘာဝ ဘေးအန္တရာယ် ဆိုးများ ကြောင့် ဖြစ်ပေါ်လာသော သက်ရောက်မှုများကို ထပ်လောင်းပေါင်းစပ်ပေးသလို ဖြစ်နေပါသည်။

တောများပြုန်းတီးခြင်း၊ မြေယာရှုခင်းပြောင်းလဲမှု၊ ဂေဟစနစ်ဝန်ဆောင်မှု၊ ရေထုညစ်ညမ်းမှုတို့သည် အဓိက ပတ်ဝန်းကျင်ဆိုင်ရာ ဆိုးကျိုးများဖြစ်ပါသည်။ ဤပတ်ဝန်းကျင်ဆိုးကျိုးသက်ရောက်မှုများသည် ဒေသ၏ အင်အားနည်းပါးသော ပြည်သူ များအတွက်လည်း စိုးရိမ်စရာဖြစ်ပါသည်။

အခြေခံ အကြံပြုချက်များနှင့် ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု

ဤအစီရင်ခံစာသည် ပတ်ဝန်းကျင်ဆိုင်ရာ ကာကွယ်ခြင်းနှင့်ဂေဟစနစ်ဆိုင်ရာဝန်ဆောင်မှုများ ထိန်းသိမ်းခြင်းတို့ တိုးတက်စေရန် ရည်သန်၍ ဆောင်ရွက်ရမည့် ကိစ္စများကို အကြံပြုထားပါသည်။ အကြံပြုချက်များကို မြို့နယ်အတွင်း ရှိရင်းစွဲနှင့် အနာဂတ် လုပ်ငန်းများဆောင်ရွက်ရာတွင် ထည့်သွင်းစဉ်းစားရန်ဖြစ်ပါသည်။

အစိုးရ ဌာနဆိုင်ရာ အဖွဲ့အစည်းများ

1. ဤအစီရင်ခံစာ အခန်း(၂) တွင်ဖော်ပြထားသော ပတ်ဝန်းကျင်နှင့် အခြား ဆက်စပ်ဥပဒေများကို အစိုးရဌာနဆိုင်ရာ များအနေနှင့် လေ့လာသုံးသပ်ပြီး ဥပဒေစိုးမိုးရေး အတွက် တာဝန်ရှိသည့် အဖွဲ့အစည်းများ ဌာနများကို တာဝန်ပေးခြင်းများ ပြုလုပ်ရန်
2. ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အကောင်အထည်ဖော်မှုကို နားလည်သဘောပေါက်ရန် ၊

ဥပဒေစိုးမိုးမှုများကို လေ့လာစောင့်ကြည့်ရန် နှင့် ပတ်ဂန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ကိစ္စများကို လေ့လာစောင့်ကြပ်ရေး နည်းလမ်းများကို တည်ဆောက်နိုင်ရန်အတွက် မြို့နယ်နှင့် ပြည်နယ်ဒေသ အတွင်း ပတ်ဂန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အဖွဲ့အစည်း၊ ကော်မီတီဖွဲ့စည်းရန်

3. ဂေဟစနစ်မှ ပေးသော ဂန်ဆောင်မှုများနှင့် ဒဏ်ခံနိုင်စွမ်းဆက်စပ်ပုံများကို အခြေခံသော ပတ်ဂန်းကျင်ဆိုင်ရာ အသိပညာပေး လုပ်ငန်းများကို ဒေသခံလူထုအတွင်း ဆောင်ရွက်သွားရန်
4. အမှိုက်သိမ်းဆည်းနည်းများ၊ အမှိုက်ပစ်နည်းများ နှင့် ရေရှည်ဖွံ့ဖြိုးတိုးတက်မှုကို ဦးတည်သော အမှိုက်များစီမံခန့်ခွဲမှု များနှင့် ပတ်သက်သော အသိပညာပေး လုပ်ငန်းများ ပါဂင်သည့် မြို့နယ်ဆိုင်ရာ အမှိုက်စီမံခန့်ခွဲမှု စီမံချက်များ တည်ဆောက်နိုင်ရန်။ ထိုစီမံချက်သည် အမျိုးသား စွန့်ပစ်အမှိုက်ဆိုင်ရာ မဟာဗျူဟာနှင့်အညီ ရေးဆွဲရန်
5. ပတ်ဂန်းကျင် ထိန်းသိမ်းရေးဌာနနှင့် အခြားဆက်စပ်ဌာနများမှ ဂန်ထမ်းများကို ပတ်ဂန်းကျင်ဆိုင်ရာ ပြဌာန်းချက်ဥပဒေများ လက်တွေ့အကောင်အထည်ဖော်ရေးဆိုင်ရာ အရည်အသွေးမြှင့်တင်မှုများ ပြုလုပ်ရန်
6. ဒေသအတွင်းရှိ ပတ်ဂန်းကျင်ထိန်းသိမ်းရေးဌာနမှ ဂန်ထမ်းများကို စီးပွားရေးလုပ်ငန်းများ၏ ပတ်ဂန်းကျင်ဆိုင်ရာ အကောင်အထည်ဖော် ဆောင်ရွက်မှုများကို လေ့လာစောင့်ကြပ်မှုနှင့် ပတ်သတ်သော အရည်အသွေး ဆိုင်ရာသင်တန်းများ ပို့ချပေးခြင်းများ ပြုလုပ်နိုင်ရန်
7. ဖွံ့ဖြိုးရေးလုပ်ငန်းများကြောင့် ပတ်ဂန်းကျင်နှင့် ဒေသခံလူထုတို့၏ ရာသီဥတုဆိုးဂါးမှု ဒဏ်ခံနိုင်စွမ်းကို မည်သို့မည်ပုံ သက်ရောက်မှုရှိနိုင်ကြောင်း ကုမ္ပဏီများ အဖွဲ့အစည်းများမှ ပွင့်လင်းစွာ တင်ပြနိုင်ရေးအတွက် တွန်းအားပေးရန်
8. မြို့နယ်အတွင်းရှိ ဌာနဆိုင်ရာများ အနေနှင့် ရာသီဥတုပြောင်းလဲမှုများ၊ ရာသီဥတု ပြောင်းလဲမှုများကြောင့် ဖြစ်ပေါ်လာသော ဘေးနှင့်ဖိစီးမှုများ၊ လက်ရှိစီမံကိန်းများမှ နောင်တွင် ဖြစ်ပေါ်လာနိုင်သော ပတ်ဂန်းကျင် ဆိုးကျိုးသက်ရောက်မှုများကို နားလည်နိုင်ရန်အတွက် BRACED စီမံကိန်းမှ ပြုစုခဲ့သော ဗျူဟာမြောက် ပတ်ဂန်းကျင်ဆိုင်ရာ ဆန်းစစ်ခြင်းနှင့် ကျေးရွာလူထု`၏ ဘေးအန္တရာယ်ဒဏ် ခံနိုင်စွမ်း စစ်တမ်းများကို လေ့လာ သုံးသပ်ရန်။(တောင်ကုတ်ဒေသအတွင်းရှိ အင်အားအနည်းပါးဆုံး ဒေသခံတို့၏ ဘေးဒဏ်ခံနိုင်စွမ်း မြင့်မား လာစေရေးအတွက် ဒေသခံတို့မှာ ရှာဖွေ ဖော်ထုတ်ထားသော လုပ်ဆောင်ရမည့် လုပ်ငန်းများ အားလုံးကို အတူတကွ ပေါင်းစည်း၍ ပိုမိုကျယ်ပြန့်သော စီမံချက်များ ရေးဆွဲသင့်ပါသည်။ ထိုသို့ပြုလုပ်ရာ တွင်အစိုးရနှင့် ပြည်သူတို့ အတူတကွ လုပ်ကိုင်နိုင်မည့် ပတ်ဂန်းကျင်နှင့် ဂေဟစနစ်ဆိုင်ရာ စီမံကိန်းများအတွက် အသေးစားရံပုံငွေများ ရရှိအောင် ဆောင်ရွက်ခြင်းဖြင့် ဇီဂမျိုးစုံမျိုးကွဲ၏ ဂေဟစနစ်ဆိုင်ရာ ဂန်ဆောင်မှုများ မြင့်တက်လာနိုင်သည်" ဆိုသော အချက်ကိုလည်း ထည့်သွင်းနိုင်ပါသည်)
9. မြို့နယ်ဆိုင်ရာ ဘေးအန္တရာယ်စီမံချက်ရေးဆွဲရာတွင် ဤအစီရင်ခံစာပါ အချက်အလက်များ၊ အန္တရာယ်စစ်တမ်းများ ကို ကိုးကားနိုင်ရန် နှင့် အဆိုပါ စီမံချက်သည် ဤအစီရင်ခံစာ နှင့်အတူ အပြန်အလှန် ပေါင်းစည်းနိုင်ရန်

10. တောင်ကုတ်ချောင်း၏ရေအရည်အသွေး အခြေခံ အချက်အလက်များနှင့် ဒေသ၏ လေထုအရည်အသွေး အခြေခံအချက်အလက်များ တိုင်းတာရန်

စက်ရုံအလုပ်ရုံများ နှင့် စီးပွားရေးလုပ်ငန်းများ

11. စီမံကိန်းအသစ်များနှင့်လုပ်ငန်း အသစ်များ၏ ကနဦးအဆင့်တွင် လူထုတွေ့ဆုံရေးနှင့် အကြံဉာဏ် တောင်းခံရေး လုပ်ငန်းစဉ်များ ပိုမိုဆောင်ရွက်လာနိုင်စေရန်
12. စီမံကိန်းနှင့် စီးပွားရေးလုပ်ငန်းများ၏ ပတ်ဝန်းကျင် ၊ကျန်းမာရေးနှင့် လုပ်ငန်းခွင်ဆိုင်ရာ ဘေးအန္တရာယ် ကင်းရှင်ရေး ဆိုင်ရာမူဝါဒများ၊ စံနှုန်းများကို တရားဝင်ထုတ်ပြန်ခြင်းဖြင့် ပွင်းလင်းမြင်သာမှုများကို ဖော်ဆောင်ရန်
13. ရပ်ရွာလူထု ဝန်ဆောင်မှုလုပ်ငန်းများ နှင့်စနစ်များ(စိုက်ပျိုးရေးဝန်ဆောင်မှုများ၊ ရပ်ရွာ အခြေခံ အဆောက်အဦများ၊စွမ်းအင်နှင့် ရေရရှိရေး ဝန်ဆောင်မှုများ စသည်ဖြင့်)၊ ရပ်ရွာလူထု၏ အစွန်းရောက် ရာသီဥတုများ၊ ပတ်ဝန်းကျင် ဆိုးကျိုးများအပေါ် ဒဏ်ခံနိုင်ရည်စွမ်းကို မည်သို့ သက်ရောက်နိုင်သည် ဆိုသော တွေ့ရှိချက်များကို ဖေမျှဖြန့်ဖြူးရန်၊ ဆိုးကျိုးများကို လျော့ပါးစေသော အစီအမံများ ဆောင်ရွက်ရန်
14. ဖွံ့ဖြိုးရေးစီမံကိန်းများနှင့် စီးပွားရေးလုပ်ငန်းများသည် စီးပွားရေး တိုးတက်မှုနှင့် အကျိုးအမြတ် ရနိုင်မှုကို ဦးတည်သော ဘေးဒဏ်ခံနိုင်စွမ်း ဆိုင်ရာ လုပ်ငန်းများ ပါဝင်သည့် စီးပွားရေး ဆောင်ရွက်မှုများ ပိုမိုများပြားလာစေရန်အတွက် တွန်းအားပေးရန် (ဥပမာ- စိုက်ပျိုးရေးနှင့်သက်ဆိုင်သော လုပ်ငန်းများ၊ ရပ်ရွာလူထုအတွက် အခြေခံ အဆောက်အဦများ၊စွမ်းအင်နှင့် ရေ ဖြန့်ဖြူးရေး ဝန်ဆောင်မှ လုပ်ငန်းများ)
15. လုပ်ငန်းခွင်ဆိုင်ရာ ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးများနည်းတူ စီမံကိန်းအနီးတဝိုက်မှ ဒေသခံပြည်သူတို့၏ ကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေးအတွက်လည်း ဆောင်ရွက်ရန်
16. အခြား စီးပွားရေးဆိုင်ရာ လုပ်ငန်းများနှင့်အတူ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနှင့် ပတ်ဝန်းကျင် ညစ်ညမ်းမှုများ ကာကွယ်ရေး တို့သည်လည်း အရေးကြီးကြောင်း သတ်မှတ်ထားနိုင်ရန်
17. တည်ဆဲ EIA လုပ်ထုံးလုပ်နည်း နှင့်အညီ စီမံကိန်းနှင့်ဆိုင်သော ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံချက်များကို ရေးဆွဲအကောင်အထည်ဖော်ရန်
18. စီးပွားရေးနှင့် ဖွံ့ဖြိုးရေးလုပ်ငန်း များကြောင့် ပတ်ဝန်းကျင်ဆိုးကျိုးနှင့် ဒေသခံတို့၏ အစွန်းရောက် ရာသီဥတုဒဏ်ခံစွမ်းရည်များကို မထိခိုက်စေရန်အတွက် မိမိတို့၏ လုပ်သားထုများကို ပတ်ဝန်းကျင်ဆိုင်ရာ သင်တန်းများပေးရန်အတွက် အစီအစဉ်များ ရေးဆွဲရန်
19. ဒေသခံတို့၏ ရာသီဥတုဒဏ်ခံနိုင်စွမ်းရည် မြင့်တက်လာစေရန် ၊ ဂေဟစနစ်မှပေးသော ဝန်ဆောင်မှုများကို ထိန်းသိမ်းရန် နှင့် ပတ်ဝန်းကျင်ဆိုင်ရာစီမံချက်များ ပါဝင်သော လူမှုဘဝဝန်သိမ့် အစီအစဉ်များရေးဆွဲ အကောင်အထည်ဖော်ရန်

အရပ်ဖက်အဖွဲ့အစည်းနှင့်ဒေသခံလူထု

20. သက်ဆိုင်ဆက်စပ်သူများ အစည်းအဝေးများတွင် ပါဝင်ဆွေးနွေးနိုင်ရန်

21. မိမိတို့အစဉ်အဆက်တွေ့ကြုံခဲ့ရသော အဖြစ်အပျက်များ ဗဟုသုတများကို ထိုသို့သော ဆွေးနွေးပွဲများတွင် အတွေ့အကြုံဖလှယ်ခြင်း၊ စိတ်ပူပန်သောအကြောင်းများနှင့် ဖြစ်ပေါ်နိုင်သော စိမ်ခေါ်မှုများကို တင်ပြနိုင်ရန်

22. အစိုးရနှင့်အခြားအဖွဲ့အစည်းများမှ ဦးဆောင်ကျင်းပသော အပြုသဘောဆောင်သည့် ပတ်ဝန်းကျင်ဆိုင်ရာ ထိန်းသိမ်းရေး ပညာပေးရေး လုပ်ရှားမှုများတွင်တက်ကြွစွာပါဝင်ရန်

23. စီမံကိန်းအသစ်များ၏ ဥပဒေ ၊လုပ်ထုံးလုပ်နည်းများ နှင့်အညီ ဆောင်ရွက်ခြင်း ရှိမရှိ သိရှိ ရန်အတွင် ပုဂ္ဂလိက လုပ်ငန်းများ စောင့်ကြည့်ရေးလုပ်ငန်းစဉ် ထူထောင်ရန်

24. စီးပွားရေးနှင့် အခြားဖွံ့ဖြိုးတိုးတက်ရေးလုပ်ငန်းများ၏ တာဝန်ယူမှုနှင့် တာဝန်ခံမှုများ တိုးတက်လာစေရန် လုပ်ငန်းများ၏ ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံဆောင်ရွက်မှုများကို လေ့လာစောင့်ကြည့်ရန်

Chapter 1 **Introduction and Background**

1.1 Background

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

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

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

Accordingly, MEI under the BRACED project has classified this study as a Township Environmental Assessment (TEA) . The TEA study however follows similar steps and methodologies as set out in SEA.

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

It is anticipated that the information and recommendations provided in this report will be utilized in local level development planning. This data will further help to identify potential environmental changes and impacts on communities that might impact on capacities or vulnerabilities within communities. It will also be utilized to identify how ecosystem and environmental management can support communities to strengthen resilience to a variety disaster and, climate shocks and stresses. This will indirectly benefit to women and children by supporting resilience building mechanism through its recommendations.

In addition, in line with BRACED's objectives, this document provides general guidance notes and frameworks on how to integrate climate change risk considerations

into strategic planning and inclusion of climate adaption and resilience strategy into decision making process as far as possible in the region. Servicing beyond the BRACED project (2015-2017), the contents of this TEA can be regarded as basic environmental reference for future sustainable development activities and would feed into any full SEA undertaken by government departments.

1.2 Introduction of BRACED

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

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

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

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

Plan Myanmar, the implementing partner of the program, has undertaken community resilience action planning in selected villages. Based on Community Risk Assessments, activities are implemented to strengthen resilience including capacity building trainings, resilience actions plans.

Myanmar Environment Institute (MEI) is working to complement community resilience and institutional support activities by carrying out township environmental assessment in all eight townships. Study looks at the environmental threats posed by

existing development projects, sectoral plans, and services to public and business activities and then predict future trends. Based on the finding, MEI prepares generic entry point and recommendations for township environmental management framework and provides trainings to government officials to lead on implementation of TEA recommendations.

Introduction of SEA in Myanmar

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

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

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

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

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

In Myanmar, EIA (Environmental Impact Assessment) was introduced in the last few years. Being project specific, EIA has some limitations as it does not contribute to higher level decision making. Thus SEA has emerged globally to bridge this gap. While EIA focus on individual projects, SEA aims to provide overall guidance toward integrating environmental sustainability into higher level planning process and policy choices. In general EIA approach is fairly reactive whilst SEA aims to be more

proactive to mainstream environmental consideration into development proposals.

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

1.3 TEA Goal and Objective

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

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

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

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

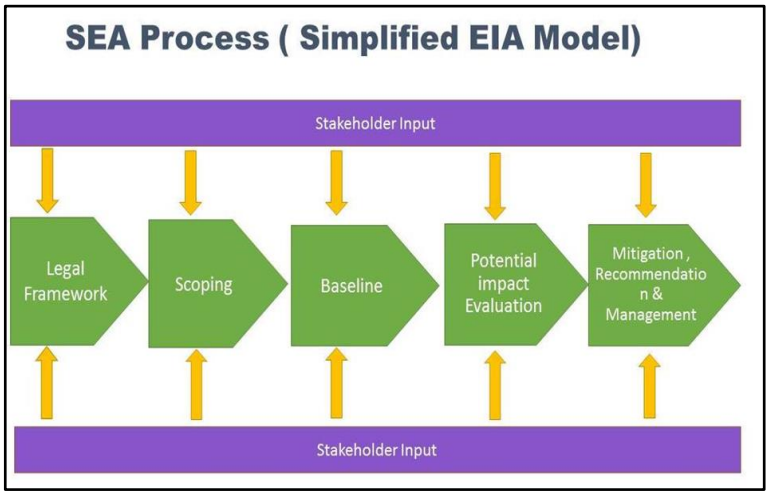
It is anticipated that recommendation and generic environmental management provided in this document shall be practically considered when implementing ongoing development plan and future potential. The recommendations of the report will continue to serve beyond BRACED project period.

1.4 SEA Methodology

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

The adopted SEA process is shown as following figure and key elements are described from staring point to the completion of process.

Figure 1SEA Process



In this simplified SEA process, stakeholder participation and consultation shall be considered and included in every step as a continuous participatory approach. All feedback, suggestion and input taken from stakeholder consultations are taken into account in scoping and assessment and analysis.

In this study, the environmental assessment shall be carried out at township level emphasizing the sensitivity of ecosystems and environments in study area with reflection of regional development plans. TEA will take a broader view of the potential impacts of sectorial plans e.g. tourism sector, industrial sector and other sectors.

Analysis and evaluation of the probable impact builds on expert judgment technique from MEI team validated by a wider variety of opinions and expertise of individuals.

Data Collection Methodologies

The TEA requires a considerable amount of data and information including secondary and primary data. To make certain to be a reliable and realistic document, following methods were employed.

Literature Review and Desk Study:

The research team firstly reviewed all existing and available technical and scientific documents relevant to the arenca inluding unpublished documents and papers from institutions and government departments.

Field Data Collection

Field observations were conducted twice in March and May 2014 to collect primary data and information. During the visits, experts from MEI met with local departmental officials, some NGOs, village heads and community leaders. The meetings included focus group discussions and investigated their perceptions and opinions over social and environmental issues and concerns currently encountered in the region.

Stakeholder Consultation and Interview

Focus meetings were undertaken with various government departments in Taungup during field survey in May 2014. Transparent and open discussions with regard to environmental issues of regions were exchanged. Participants and respondents actively

discussed and disclosed information about existing activities and concerns about the environmental degradation.

1.5 Limitations

Major challenge during the study included a lack of secondary resources and information. No official environmental study has been previously performed in the region by the government.

While exploring the status of township level plans and programs currently being implemented, it was quite challenging to identify concrete development plans in documented form.

During baseline observation, the study team was unable manage to visit some significant areas in the township including mangrove communities and terrestrial forest area. Thus, the study has centered on Taungup Town and easily accessible surrounding areas. In the absence the information, or insufficient data, experiences of stakeholders shall be mainly taken into account.

More importantly, this study, given its mainly environmental focus, could not study all the issues in detail. In addition, only detrimental effects of project and services were revealed in the study instead of looking at both adverse and beneficial effects .

1.6 Environmental Scoping

The preliminary scoping study was conducted through stakeholder consultation meetings in Taungup Township and a desktop review. Opinion and suggestion from key stakeholders involved in consultation meetings were reflected in the scoping study along with finding from a literature review.

This study will assess different sectors/areas to identify potential environmental considerations such as

- Forest Types and Biodiversity
- Urban and VillageExtension , Road Network
- Deforestation Activities
- Waste Management

Key environmental issues preliminary identified are terrestrial and mangrove deforestation, waste disposal, water quality degradation and land cover change.

Chapter 2 Environmental Legislative Framework & Enabling Environment for Environmental Assessments

2.1 General

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

2.2 National Environment Policy

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

2.3 Myanmar Agenda 21

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

2.4 National Sustainable Development Strategy

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

2.5 Relevant Environmental Legislation

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

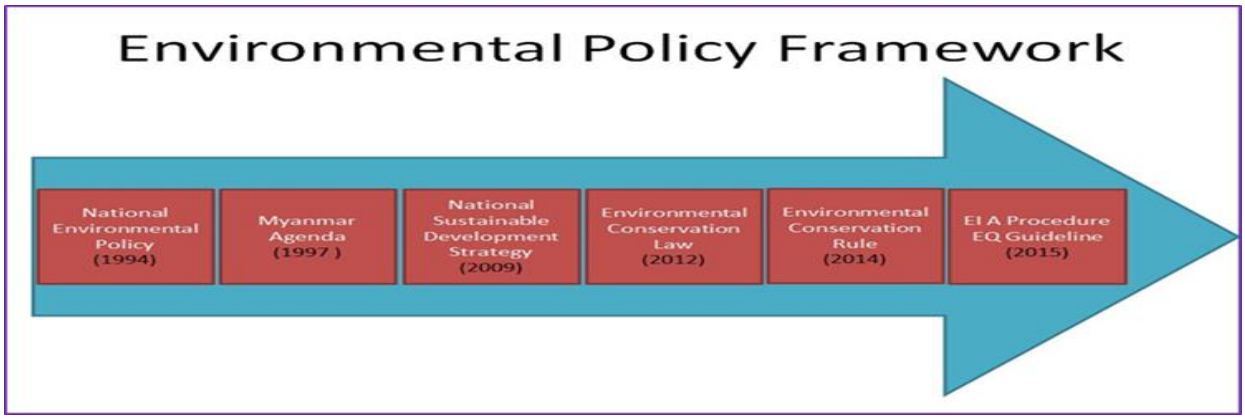
Table 1 Existing Environmental Legislation

Law and regulation	Year	Purpose
Factory Act	1951	To make effective arrangements in every factory for disposal of waste and effluence, and for matters of health, cleanliness and safety.
Public Health Law	1972	To promote and safeguard public health and to take necessary measures in respect of environmental health.
Territorial Sea and Maritime Zone Law	1977	To define and determine the Maritime Zone, Contiguous Zone, Exclusive Economic Zone and Continental Shelf and the right of the Union of Myanmar to exercise general and exclusive jurisdiction over these zones and the Continental Shelf in respect of preservation and protection of the marine environment, its resources and prevention of marine pollution.
Fishing Rights of Foreign Vessels Law	1989	To conserve fisheries and to enable systematic operation in fisheries with participation of foreign investors.
Marine Fisheries Law	1990	To conserve marine fisheries and to enable systematic operation in marine fisheries.
Forestry Law	1992	To implement forest policy and environmental conservation policy, to promote the sector of public cooperation in implementing these policies, to develop the economy of the State, to prevent destruction of forest and biodiversity, to carry out simultaneously conservation of natural forests and establishment of forest plantations and to contribute to the fuel requirements of the country.
National Environmental Policy	1994	To establish sound environment policies in the utilization of water, land, forest, mineral resources and other natural resources in order to conserve the environment and prevent its degradation.
Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law	1994	To protect wildlife, wild plants and conserve natural areas, to contribute towards works of natural scientific research, and to establish zoological gardens and botanical gardens.
Myanmar Mines	1996	To implement mineral resources policy.

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

Source: Resource and Environment Myanmar

Figure 2 Generic Environmental Policy Framework



2.6 Institutional Management and Arrangement for Environmental Policy and Strategies

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

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

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

National Coordination Framework

Natural Resource and Environmental Conservation Committees of Pyithu Hluttaw (*Lower house)* and Amyotha Hluttaw(*Upper House)* were formed as part of check and balance mechanism of Phuhtaungsu Hluttaw. These committees will serve as advisory board to Hluttaw. Responsibilities held by these bodies include gathering information about the widespread environmental issues and complaints from communities and affected people, serving as an advising administrative bodies for more transparent and effective implementation of environmental policy and regulations, reviewing existing legislation and promulgating new natural resource and environmental related legislation.

Ministry of Natural Resources and Environmental Conservation

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

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

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

Environmental Conservation Department (ECD)

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

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

Being a national coordination body related to environmental matters, ECD has been hosting various environmental and sustainable related workshops and meetings in an effort to develop human resource, knowledge and technical expertise in environmental sector, transferring and encouraging knowledge sharing from international counterparts and experts.

ECD is also responsible for managing the national climate Change strategy development and implementation under the Myanmar Climate Change Alliance.

Regions/States Environment and Climate Change Supervision Committee

With notification, Union Government office gives order to form regional, state and Naypyidaw level, Regional Environmental Conservation and Supervising Committee. The Committee will be chaired by a Council member nominated by the Regional and State Government and the members are nominated by sector ministries and some

representatives from CSO. The regional ECD head will act as secretary of committee. The tasks given are[1]

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

2.7 SEA Requirement in EIA Procedure

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

This procedure focuses on the identification of business types needing EIA and IEE and conducting stakeholder involvement in the project in transparent way.

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

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

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

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

Thus it can be concluded that there is not a strong mandatory requirement for conducting SEA according to existing environmental regulations.

2.8 Institutional Framework related to Resettlement and Land Acquisition

Principle legislations concerning land acquisition are:

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

Following table presents the existing legislations which govern the land use and land acquisition in Myanmar.

Table 2 Existing Land Management Legislation

Legislative Framework	Year	Major Provision
Constitution	2008	The Union is the ultimate owner of all lands and all natural resources above and below the ground, above and beneath the water and in the atmosphere in the Union.
Land Acquisition Act	1894	This is basic legal framework for land acquisition providing government to acquire the land from landowner. Major elements include demarcation of boundary, declaration of action and role and responsibility of collectors.
SEZ Law	2014	This law provides framework for forming of working committee, management committee and supporting body with various government department and responsible authority for land acquisition.
Farmland Law	2012	This law focuses on land use right of farmers and details the process of permission to potential farmers who are eligible. Under this law. Land can be sold, leased and transferred freely by legitimate land owner. Role and responsibility of farmland administrative bodies of various levels are defined in detail.
Vacant, Fallow and	2012	This law aims at providing framework for effective use of land. Investor can apply land right to the government for

Virgin Land Law		basic structure or other investment which would benefit for the sake of state.
National Land Use Policy	2016	This policy was released recently to ensure the systematic land use management and administration of present and future so as to improve food security, water resource development, transportation, business development and to protect environment and cultural heritage.

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

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

2.9 Institutional Analysis on Environmental Governance

In review of institutional and organizational management in environmental governance, the responsibly and accountability are still unclear among state and regional department, line ministries, Hluttaw and MONREC. ECD has been currently increasing staffing to strengthen its capacity to enhance the environmental governance of Myanmar. However, it is observed that there is room for improvement in department such as capacity for monitoring, environmental audit, technical knowledge, skill and experience of staff assigned for the specific duty. In order to fill this gap, international organizations such as ADB and IFC has been continuously delivering capacity building programs including monitoring of water and air pollution, reviewing technique of EIA, IEE and sustainable hydropower to staff of environmental sections of Ministry . ECD has opened its branches in 14 States and Regions.

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

Viewing implementation of legislative framework, environmental policy is not very effective on account of aforementioned factors. Meanwhile ECD has been putting its efforts to improve the department's capacity and capability to address the

environmental conflicts and disputes in development projects at both national and regional level.

2.10 Township Level Environmental Management (Taungup)

There is no organized structure for environmental governance and management in Taungup Township. Sectoral department separately takes responsible for managing environment pertaining to their activity. Whilst forest department monitors the status of deforestation and losses of wildlife, township development committee handles solid waste management. Regional ECD was formed in Sittwe, capital of Rakhine Region, as regional focal unit to oversee the environmental management of region and to promote environmental awareness among public.

GAD (General Administrative Department) has responsibility for overall township management and governance.

Chapter 3 Environmental Baseline, Key Environmental Issues and Vulnerabilies

3.1 Environmental Baseline

The fundamental objective of establishing environmental baseline information is to understand the current status of environmental and social elements of region and their trends, to realize environmental sensitivity and to serve as basic environmental reference of region.

Location

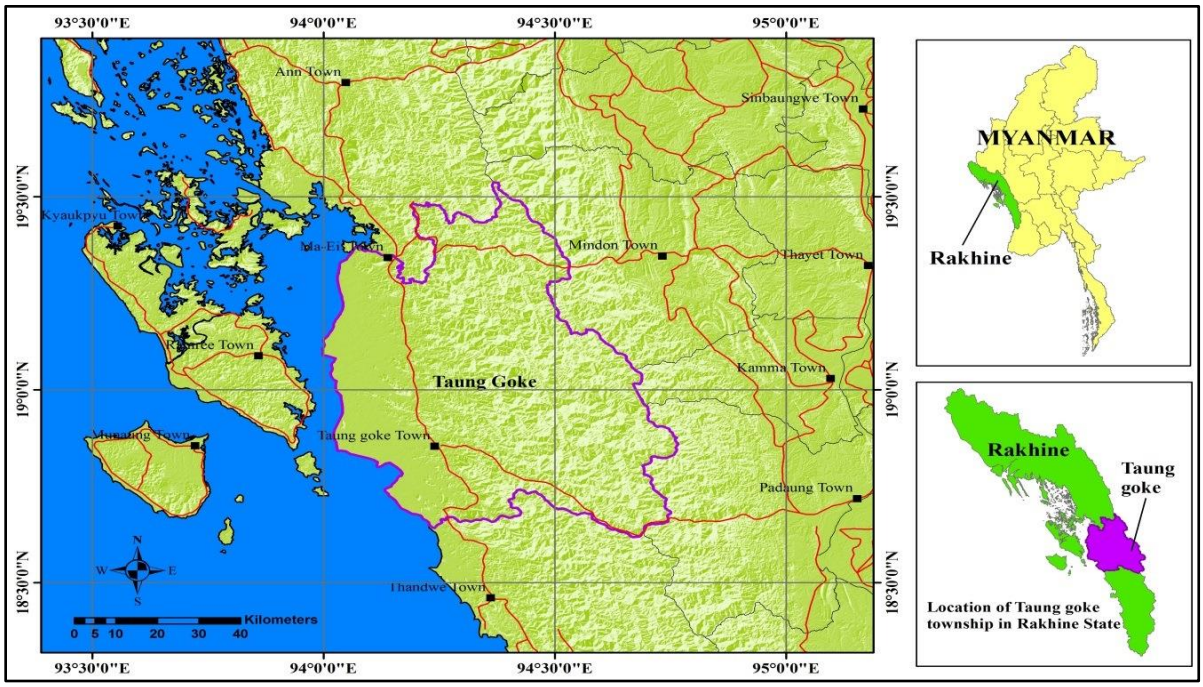
Taungup is situated in the western coastal region of Myanmar and administratively under Rakhine Region and Thandwe District. The town is latitudinally located between 18° 38'North and 19° 20'North and longitudinally between 93° 59'East and 94° 18Éast. It is part of Taungup Township, occupying the middle portion of Rakhine State, flanked by the Bay of Bengal in the western coastal strip of the Union of Myanmar. The eastern three-fourths of the Taungup Township is hilly of Rakhine Yoma. To the west lies the narrow coastal lowland. The mangrove forest is situated between the lowland and the sea, occupying one-fifth of the township area. The extreme length from north to south is 49.083 miles (79 kilometers) and the extreme breadth from east to west is 21.7 miles (35 kilometers).

The township covers 2057.25 square miles (5328 square kilometers) and its western boundary (about 52 miles or 83 km) is part of the Bay of Bengal. Though it is closed to the sea, Rambye and Munaung islands are 4 to 20 miles away from the coast.This results in Taungup being protected from strong sea wave to a certain extent. On its eastern side, about 65 per cent of the township is part of the Rakhine Yoma mountain ranges and its foothills while the remaining area is low land coastal plain. Taungup River or Taungup Chaung is the principle drainage flowing from the east toward the bay. Tanlwe River, Ma-E River and Kayaing River are also flowing in similar direction. The Location of the township is shown in following figure.

River System

Physiographically, the township is part of the Rakhine Yoma and thus except the narrow coastal strip of the west, mountain ranges and spurs are the dominant landforms. The land dips towards the west and coastal lowland plain is manifested by the tidal marshes along the western margin. The mangrove forests find the fertile field within the tidal limits and on sheltered muddy coastal areas. The major streams which

Figure 3 Location of Taungup Township



drain through the township are the Taungup, Tanlwe, Sabyin, Lamu, and Ma-i taking their sources over the Rakhine Yoma. Number streamlets join these rivers.

The Taungup creek, one of the major streams, originates over the Rakhine Yoma and flows westward into the Bay of Bengal after crossing the mangrove tidal flat. The Thinganet creek and its tributaries join the river from the south and the Pattaya, Kanyindaing and Zalonma creeks from the north.

The Tanlwe River rises over the Rakhine Yoma as the Khayingyi and Tazargyi streams at the upper reach. The two streams join together near Htama, Khinmon and Kyweya hills. After flowing about 20 miles (32 kilometers) through the footslope and low plain, the river becomes braided and small delta is formed joining the Kaleintaung River. The prominent estuaries to this stream network are Kyauksalaung, We, Myaunggyi, Myaungshe, Pyainggun, Kyobwe, and Kanbyin.

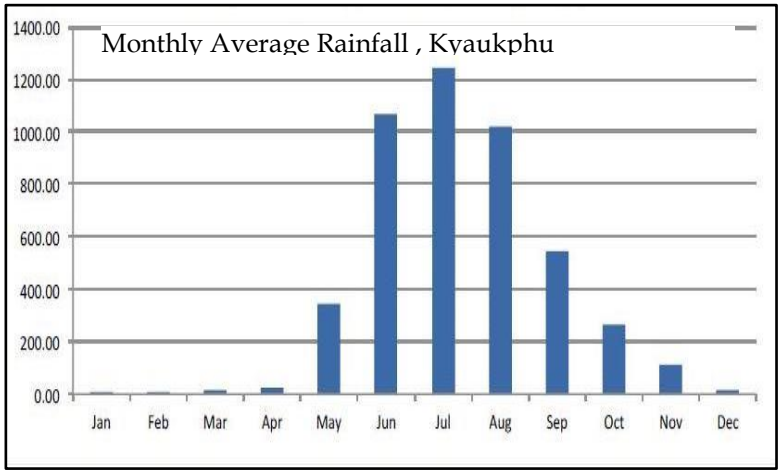
Figure 4 Taungup Stream

Sabyin Creek takes its sources over a mountain spur of the Rakhine Yoma, having an elevation of about about 625 meter (2050.52 feet). Several streams join it near Sabyin village and the channel especially Hngepyaw, Tanlwe and Kama become bifurcated before flowing into the Kaleintaung River.

Lamu creek rises over Tadagyikyaw Mountain of Rakhine Yoma at an elevation of about 625 meter (2050.52 feet). The creek is formed by the merging together of Kanbauk, Lali and Zee creeks at the upper reaches. It braids into Taungyin, Sabagyi, Indaing, Sutha and Rede and finally joins the Kaleintaung River. Ma-i creek takes its source over Myinataung Mountain in Ann Township and flows westwards of the boundary between Ann and Taungup townships. The creek also bifurcates in Khamaungdaw and Webauk and eventaually joins the Kaleintaung river. Apart from the above-mention creek, other locally important streams are Kayaing, Kyaukpyo, Gamon,Daung Zaing, Kanpauk, Kali and Kywelu.

Climatology[3]

Regional Integrated Multi-Hazard Early Warning System (RIMES), a technical partner to United Nation Human Settlement Programme (UN- Habitat) ,as part of BRACED program has prepared climate profile (climate variability, extremes and trends) of central dry, coastal and hilly zone. In Rakhine long term observation data from Kyaukphyu has been analysised in the absence of observation station in Taungup. Since, Taungup falls within same coastal region of Kyaukphyu, it is believed that findings from this Kyaukphyu report also undoubtly reflect the climate profile of Taungup.



Similar to Kyaukpyu, Taungup has a tropical monsoon climate with warmer temperature throughout the year. The weather and climatology of study area are predominately influenced by Northeast and Southwest Monsoon with short transitional periods between them. Temperature is warm through the year although there is winter priod from December to February .

The Southwest monsoon brings wet season between May and October whereas The Northeast Monsoon dry season from November to April . Kyaukpyu , the wettest of townships being studied , rceives siginificant amount of rainfall with unimodal peak .

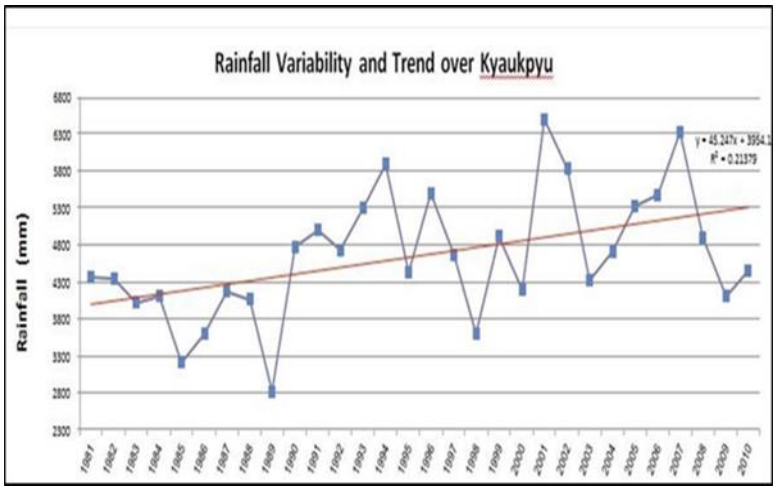
[3] Climate Profile , RIMES, UN-Habitat BRACED Program

According to figure, July receives hightest average rainfall with more than 1200 mm followed by Jun (>1000 mm) and August (1000 mm) .

Rainfall Varieties , Extreme and Trend

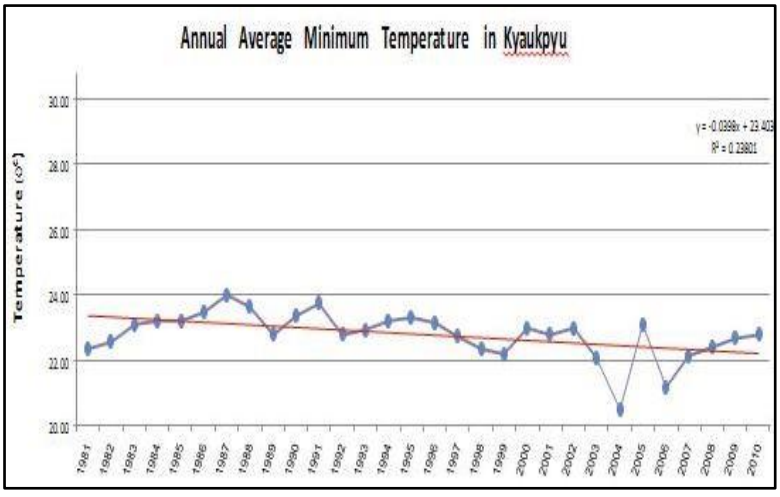
This study adopts the baseline period of 1981 to 2010 for deriving climate normals and for other relevant historical data analysis.

The township receives average annual rainfall of about 4655 mm. Within 30 years period (2001) , it was observed that annual rainfall recorded in 2001 was 6511mm exceeding the average nearly more than 1800 mm. The lowest annual rainfall was in 1981 with 2821 mm.



The annual rainfall shows increasing trend, indicative of more years, within the period of study where rainfall exceeds average.

The most extreme 24 hour rainfall events were 411 mm in 6 July 2007, 394 mm in 22 October 1992 and 344 mm in 23 October 2010. While most of the extreme rainfall recorded in wet seasons, excursions were recorded in dry season. 10 rainfall events exceeding 100 mm were recorded in dry seasons within 30 years. 288 mm rainfall event was recorded in 31March 2010.



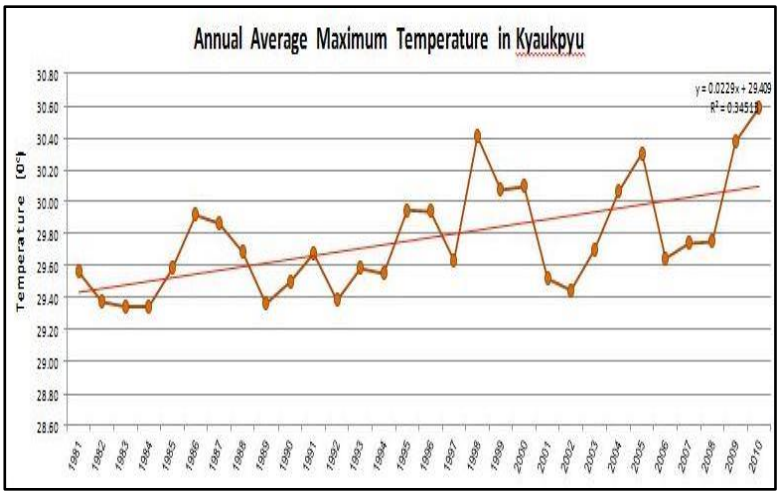
Overall 96% of annual rainfall is contributed by the wet season rainfall. Excursion from this pattern is notable in 1991, 2005, 1995 and 1990 contribution of the wet season is below 90%. This indicates that significant rainfall also received in dry season in some years.

Wet season rainfall shows [4]an increasing trend mirroring the increasing trend in annual average rainfall. Similarly, the number of raining days during wet season shows an increasing trend. With average number of wet days at around 123, 2008 recorded the highest numbers of wet days at 137 followed by 2001 with 136 days. The least number of wet days was in 1985 with only 99 days. This year was also the second driest year within 30 years period.

In Kyaukpyu, both rainfall quantity and number of wet days show an increasing trend, indicative of more years of wetter wet seasons against average.

Temperature Varieties , Extreme and Trend

Maximum temperature is averaged at 29.76°C. In 2010, the highest annual average temperature was recorded at 30.59° C. The coolest minimum temperature was recorded in 2004 was at 20.49°C.



Within 30 years period, about 54% of days registered maximum temperature above average. Of this, 43 days exceeds average 35°C.

In 30 years period the highest temperature was recorded in 19 September 1988 at 39.7°C. The next warmest temperature was recorded in 11 May 1986 at 37.7°C.

In 30 years period, the warmest night is in 26 May 1983 at 30°C. 29°C was recorded four times in all in the month of May.

The data suggest that warmer days have been observed while nights have been cooler.

General Geology

Soil Type

Types of soil common in Taungup Township are (i) Red Brown Forest Soil; (ii) Yellow Brown Forest Soil; (iii) Meadow Soil and (iv) Saline Swampy Forest Soil.

Table 3 Soil Type

Soil Type	Description
Red Brown	These soils cover 32 percent of the watershed area. These soils are

[4] Climate Profile Report, RIMES, BRACED Program

Forest Soil(Ferrago-Rhode)	found under various types of vegetation cover in the eastern part of the watershed area. They are found on the well-drained hill slopes. The upper foothill zone of Rakhine Yoma is occupied by red brown forest soil. These soils possess a good crumby structure and good drainage. They are well-developed and thick in soil column. Usually they are medium to heavy loam. These soils are characterized by the predominating red brown colour of the profile. In the topsoil, the colour is darker due to the presence of humus, but it becomes brighter to lighter with depth. The soil colour varies in the different profiles from dark red brown to bright orange. These soil are friable and well-structured, but often stony. They have poor humus and slightly acid with pH value of 5. 5 to 6. 5 but its acidity increases somewhat with the depth, which is rather unusual. These soils are quite suitable for silviculture and can be used for plantations and gardens in topographically favorable location.
Yellow brown Forest soil	These soils cover 39 percent of the watershed area. These soils are found at the lower part of the Rakhine Yoma in the middle part of the watershed area. They occur in the low foothills at the elevation of 92 to 957 meters above sea level, running from east to west between the Red brown forest soil of the eastern region and meadow soils on the plain. These soils are characterized by yellowish brown to brown colour, darker in the topsoil and each other gradually. These soils are light loamy in texture. These soils are slightly acid and the pH value is 5 to 6. 5.
Meadow soil	These soils cover 10 percent of the watershed area. These type of soils are found along the Taungup Chaung which is located lower part of watershed area. They occupy the places that lie 15 and 30 meters above the sea level. The alluviums are variable in particle composition ranging from clay in the lower place to loamy in higher place. These soils are best suited for different kind of crops such as chilies, vegetables and sugarcane
Saline swampy Mangrove forest soil	These soils are found at the mouth of rivers and coastal region in the western part of watershed area. It is subject to undulation and becomes swampy soils. If it is well drained, it could be reclaimed as paddy land.

Air Quality

There were no major sources of air pollution. Observations have indicated that the minor emission sources of air pollutants in the study area are mobile sources such as

motor bikes and bushfire. The level of air pollution is unknown as no monitoring data was available in the area.The conclusion is that air pollution in the area remains insignificant. However, its is important to note that major source of cooking account for 89% of total cooking source which is followed by use of charcoal with 10 %.

Water Quality

Uncontrolled and inappropriate waste disposal practices leads to various environmental issues including degradation of water and soil quality of the receiving environment. However, there is no water quality measurement and analysis conducted of the water bodies of area**.**

Natural Vegetation

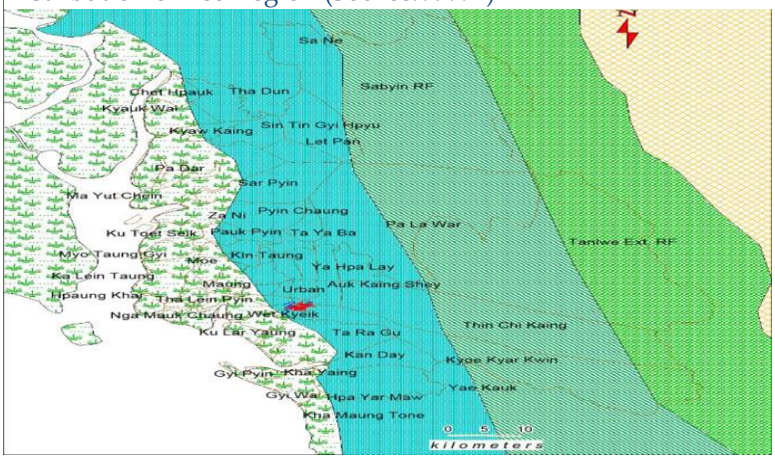
Taungup experiences a number of different climates including high temperature andabundant rainfall. Varying elevations, geology and soil types results in a highly dispersed and diverse plant species. Reserve Forests in the township are Yahu Reserved Forest,Sabyin Reserve Forests, Lamu Reserved Forest, Kyeya Reserved Forest, Khu Reserved Forest, Shwehle Reserved Forest, Yankhaw Reserved Forest and Tanlwe.

Evergreen Forest	This is part of the Chin-Arakan Montane Forest of WWF ecoregion. Evergreen forests are mainly found in the Tanlwe Ext. Reserve Forest, which is located at the foothills of Rakhine Yoma and lower part of the spurs of Rakhine Yoma. The major species and valuable hardwood species are Kanyin (Dipterocarpus spp.)Pyinkado (Xyliadalabriformis), Thingan (Hopea odorata), Thabyay (Eugenia spp.), Taungthayet (Swintonia floribunda), Pyinma (Lagerstroe muia) and others. Presence of a large number of species of giant evergreen trees are 46 meters or higher and top canopy almost entirely evergreen and unbroken, abundance of epiphytes and climbers. Smaller trees, a tangle of canes, creeping bamboo and palms are mixed as undergrowth
Mixed Deciduous Forest	This is part of the Mixed deciduous forests are widely distributed in the foothills and some part of ridge tops in the Rakhine Yoma, eastern area of the township. There areaincludes high forest of good quality in terms of growth and value. Although evergreen trees are dominant in some areas, majority of species are deciduous. Common tree species are Pyinkado (Xylia dolabriformis), Htaukkyant (Terminalia alata Heyne & Roth), Myaukchaw (Homalium momentous), Letpan (Salmalia malabarica School & Engl) and Binga (Mitrogyna rotindifolia). In the undergrowth, Khayin bamboo and scrub are found
Coastal Rain Forest	This occurs at gravelly and sandy soils on the low ridge tops in the drier part of foothill and spurs of Rakhine Yoma. It is widely distributed in the hills along the Taungup-Thandwe motor road, the

	Taungup-Hmanni motor road and near the Sinsigaing and Tarye villages. The growth is very poor and not sufficient to produce saw timber. It is open forest with uneven canopy. The chief species are Ingyin (Pentacme suavis), Thitya, Htaukkyant (Terminalia alata Heyne & Roth), Pyinkado (Xyliadolariform Benth) Neble, Zibyu and Khabaung. Khayin bamboo was also observed and grass field undergrowth.
Tidal forest	Tidal forest (mangrove) is widely spread around the Taungup Chaung within upper tidal limit and along the coastline in the western part of watershed area. It is able to grow in mud, brought by rivers, which is deposited and periodically inundated by the tides. These forests are characterized by the growth of mangroves. Common species in the watershed area are Byu (Bruguniera cylindrical), Byu-u-talone (Bruguinra conjugate), Kabaing (Ceriops sp.), Madama (Ceriops torgal) and sea palm (Casuaria equisetifolia). Other species included in this forests are Dhani (Nypafruticans wurmb) and reeds. Nowadays, mangrove forests in Taungup Township are depleted due to overcutting for agriculture and shrimp ponds, fuel wood and other uses

Ecoregion, KBA and Protected Area

Distribution of Eco Region (Source:WWF)



Taungup townships is made up of a variety different ecosystems and natural features including primary forests, secondary woodland, scrub lands, active agricultural land, orchard land, human habitation area, mangrove forest and tidal rivers etc. The township falls in four different eco-region approved by WWF (World Wildlife Fund) namely (1) Myanmar Coastal Mangrove, (2) Myanmar Coastal Rain Forest, (3) Mizoram-Manipur-Kachin Rain Forest, and (4) Chin Hills- Arakan Yoma Mountain Forest.

There is no protected area in the study area. However, ecologically import Key Biroversity Area (KBA) known as Wunbeik Mangrover reserved area is located at the northwest section of township area.

Terriestrial Vegetation

Though prominent forests which are under control of Forest Department and do not directly belong to the local communities, people inside and nearby the forest receive ecosystem services through harvesting from fruit trees, collection of small forest-dwelling animals and indigenous medicinal plants, and firewood collection from old branches etc. In the aspect of natural hazards, mangrove forest has been protection against storm surges and Tsunami and even grass land help protect soil disintegration that could enforce landslide and flooding.Plates showing ecosystem in the Taungup Township.

KBA of Taungup (Area (Source https:/myanmarbiodiversity.org

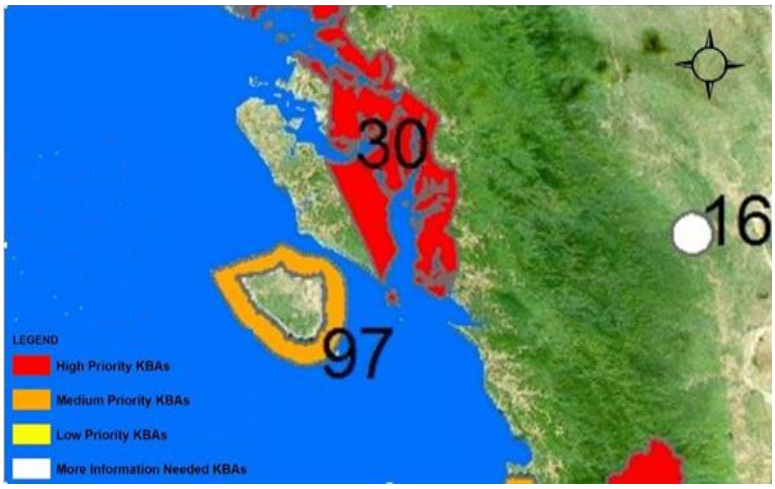
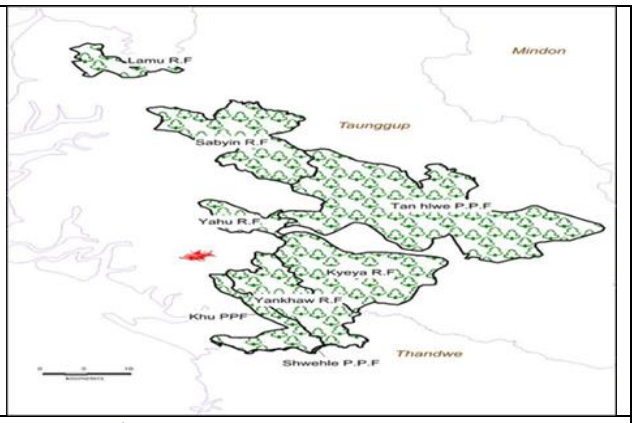


Figure 5 Various Types of Habitat

	
Coastal Mangrove (Tidal Forest)	Mangrove Habitat
	
Coastal Rain Forest (Indaing Forest	Mountain Forest

	
Secondary Forest (woodland) Habitat	**Primary Forest Remnant**
	
Active Agriculture Habitat	Village and Orchard Habitat
	
Deciduous Forest Habitat	Highly disturbed forest

	
Typical Dani (Mangrove Community	Reserved Forest Area

Ecological Analysis

Ecological analyses is organized into different sections, specifically flora and fauna to allow the proposed development to progress in a manner that also safeguards the environmental concerns of forest, wildlife and ecosystem conservation.

Industrial projects in any given planning region must learn to respect the ecological integrity and biodiversity values of that region as these are going to be the determinants of environmental quality 'as well as the sustainability of development interventions. While some tradeoffs with these values may be inevitable, it is now widely recognized that the measure of resulting environmental degradation will be an inverse indicator of sustainability. In practice, industrial development is often accompanied by significant adverse impacts on all or different components of the environment. For all potentially impacting development projects like multipurpose hydroelectric projects, thermal power plants, fertilizer plants, nuclear plants, transport and telecommunication projects, prior assessment and appraisal of impacts on the different components of environment (abiotic and biotic, including forests, wildlife and people) is imperative for several reasons. It is needed to ensure sustainability that can result from conservation of ecological processes and thereby of life support systems and gene pool resources (or biodiversity). World Conservation Strategy (IUCN 1980) has laid down three criteria for identifying impacts on the environment. The first concerns the length of time and geographic area over which the effects will be felt. The second is urgency or the quickness with which a natural system might deteriorate. Finally, it is important to assess the degree of irreversible damage to communities of plants and animals. It also needs to ensure developmental pace and economic prosperity without actually altering the state of the environment.

Often developmental projects tend to overlook forest conservation values altogether or consider them trivial and dispensable compared to the economic benefits of these projects. The adversity gets further compounded when local people's dependence upon forests does not feature in any calculations at all. Apart from direct loss due to diversion of forest land to such projects, the residual forest potentially becomes subjected to

accelerated degradation because the needs of people must be met from the much reduced residual forest area.

Wetlands are yet another category of important wildlife habitats that have been exploited by man for various natural resources and subjected to anthropogenic pressures for agriculture and urban development in developing countries. Consequently the drastic reduction in the overall availability of such habitats has led to deterioration in their ecological values. The reduced habitat quality of the remaining such areas has also resulted in disruption/disorientation of the migratory routes of birds. Progressive fragmentation of natural habitats- a process whereby contiguous tracts are reduced into numerous smaller patches can also be an outcome of unplanned developmental activities including agricultural extensions. Reduction in habitat resulting from fragmentation may, according to the theory of Island Biogeography, lead to the loss of species. Small isolated populations are subjected to loss of genetic diversity through inbreeding depression -a process that may lead to extinction.

It becomes evident from the foregoing text that there has been a rapid and ongoing diversion and degradation of forest and non forest wilderness and concomitant loss of wildlife and genetic resources. In this scenario, conservation of forests/wildlife habitats and species has become a major national issue. Of the actual forest cover of 45 % of the total geographical area has adequate forest cover. For environmental stability the country should optimally have at least 1/3rd of its geographical area under adequate forest cover. With this, it becomes all the more imperative to evaluate developmental projects to ascertain the appropriateness of their location and technology with regard to forest, wildlife and ecosystem conservation.

Analyssis on Flora of Taungup Township

Information collected by MEI researchers and secondary data available for Taungup Township concerning flora (trees and plants) are described and analyzed here for the Mangrove forest, Coastal rain forest and Mountain forest. More scientific research approach in analysis of each forest types such as Important Value Index (IVI), Ranking of Important Value Index (IVI), Species distribution by frequency classes and Diversity indices and evenness are attached in annex section of this report.

Coastal Mangrove Forest
The dominant mangrove species in this area were Excoecaria agallocha L., Rhizophora apiculata Blume, Lumnitzera racemosa Willd., and Ceriops decandra (Griff.) Ding Hou. The water salinity is ranging from 2.9-4.1 practical salinity units (psu). In Excoecaria agallocha stand, Excoecaria agallocha occupied mostly in crown cover and in some places Hibiscus tiliaceus L., and Ceriops decandra (Griff.) Ding Hou are mixed with them. The ground cover is dominated by Acanthus ilicifolius L. Rhizophora apiculata stand mainly composed of Rhizophora apiculata,mixing with Ceriops decandra, Ceriops tagal and Lumnitzera racemosa. The ground cover of Rhizophora apiculata forest is also dominated by Acanthus ilicifolius L. In the Lumnitzera

racemosa forest, Lumnitzera racemosa, Aegialitis annulata R. Brown, Sonneratia alba J.Sm. and Aegiceras sp. occupies most places. In Ceriops decandra stand, Ceriops decandra occupied mostly in crown cover and in some places Lumnitzera racemosa Willd.,Aegialitis annulata R. Brown and Excoecaria agallocha are mixed with them.

Discussion and conclusion

A total of 91 species representing 77 genera and 44families were listed in the coastal mangrove region. The list of cultivated plant species in the coastal mangrove area is shown in Table 5.7. The dominant mangrove tree species in this area were *Excoecaria agallocha* L., *Rhizophora apiculata* Blume, *Lumnitzera racemosa* Willd., and *Ceriops decandra* (Griff.) Ding Hou. The ground cover is mostly dominated by *Acanthus ilicifolius* L. The water salinity in study area is ranging from 2.9-4.1 practical salinity units (psu). The important value index is imperative to compare the ecological significance of species (Lamprecht, 1989). It indicates the extent of dominance of a species in the structure of a forest stand (Curtis and McIntosh, 1950). It is stated that species with the greatest important value are the leading dominants of the forest. Accordingly, the five leading dominants in study area were *Excoecaria agallocha* L., *Rhizophora apiculata* Blume, *Lumnitzera racemosa* Willd., *Ceriops decandra* (Griff.) Ding Hou, and *Agiceras* sp.,contributing highest IVI value (67.234, 47.959, 46.683, 41.387, 20.764) respectively. Those tree species could be considered as ecological indicator species of the study area.

Diversity indices are commonly used to assess the state of an ecosystem (e.g., as a criterion for conservation evaluation), with high diversity generally being considered a desirable property in a community or ecosystem. The value of diversity indices and evenness indices of coastal mangrove zone showed very low. Diversity value for all sample index of Shannon Wiener index (H) is 2.048, Simpsons index (D) is 6.217, Brillouin (D) is 1.998. Species distribution by frequency classes showed that 64.28% of the total number of species was in lower frequency classes, A and B, while 35.72% was observed in higher frequency class C, D and E. It indicates that the forest of coastal mangrove area is floristically heterogeneous.

The forest structures in the study area show all types of disturbance. The area has a less protection status that allows the exploitation of natural resources; such as fire wood collection, extraction for charcoal, conversion of forest area to rice cultivation. Extraction for charcoal was the major destructive force and one of the influencing factors for forest structure and surrounding ecosystem

Coastal Rain Forest

The dominant mangrove species in this area were *Excoecaria agallocha* L., *Rhizophora apiculata* Blume, Lumnitzera *racemosa* Willd., and *Ceriops decandra* (Griff.) Ding Hou. The water salinity is ranging from 2.9-4.1 practical salinity units (psu). In *Excoecaria agallocha* stand, *Excoecaria* agallocha occupied mostly in crown cover and in some places Hibiscus tiliaceus L., and Ceriops decandra (Griff.) Ding Hou are mixed with them. The ground cover is dominated by Acanthus ilicifolius L. Rhizophora apiculata

stand mainly composed of Rhizophora apiculata,*mixing with Ceriops* decandra, Ceriops tagal and Lumnitzera racemosa. The ground cover of Rhizophora apiculata forest is also dominated by Acanthus ilicifolius L. In the Lumnitzera racemosa forest, Lumnitzera racemosa, Aegialitis annulata R. Brown, Sonneratia alba J.Sm. and Aegiceras sp. occupies most places. In Ceriops decandra stand, Ceriops decandra occupied mostly in crown cover and in some places Lumnitzera racemosa Willd.,Aegialitis annulata R. Brown and Excoecaria agallocha are mixed with them.

Discussion and Conclusion

A total of 302 plant species representing 229 genera and 82 families were recorded in the study area. The dominant tree species in coastal rain forest area were *Crypteronia paniculata* Blume, Pajanelia *longifolia* K. Schum., Careya *arborea* Roxb., and *Emblica officinalis* Gaertn. The ground cover is mostly dominated by *Chromolaena odorata* (L.) R. M. King, H.Robinson, *Dalbergia volubilis* Roxb. *Stachyphryni spicatum* (Roxb.) K. Schum., *Clerodendrum infortunatum* Gaerth. and *Thespesia lampas* (Cav.) Dalzell E.A Gibson. The important value index is imperative to compare the ecological significance of species (Lamprecht, 1989). It indicates the extent of dominance of a species in the structure of a forest stand (Curtis and McIntosh, 1950). It is stated that species with the greatest important value are the leading dominants of the forest. Accordingly, the five leading dominants in study area were *Crypteronia paniculata* Blume, the second most dominant species is *Pajanelia longifolia* K. Schum.*Careya arborea* Roxb., *Emblica officinalis* Gaertn., and *Aporusa* sp.contributing highest IVI value (27.492, 20.732, 18.974, 16.471, 15.994) respectively. Those tree species could be considered as ecological indicator species of the study area.

Diversity indices are commonly used to assess the state of an ecosystem (e.g., as a criterion for conservation evaluation), with high diversity generally being considered a desirable property in a community or ecosystem. According to the result, though the diversity indices of individual sample plot are low, all sample index are relatively high. Diversity value for all sample index of Shannon Wiener index (H) is 3.311, Simpsons index (D) is 21.540, Brillouin (D) is 3.130. Presence of high species diversity and richness indicates uniqueness and potentiality of study area for conservation of ecosystem in totality. Species distribution by frequency classes showed that 70.83% of the total number of species was in lower frequency classes, A and B, while 29.17% was observed in higher frequency class C, D and E. It indicates that the forest of coastal rain forest is floristically heterogeneous.

The forest structures in the study area show some types of disturbance. The area has a less protection status that allows the exploitation of natural resources; such as illegal logging, firewood collection, and conversion to cultivated land.

Mountain Forest

Total number of species with DBH ≥10cm was 48 species. The dominant tree species in this area were *Crypteronia paniculata* Blume, *Lannea coromandelica* (Houtt.) Merr.,

Dipterocarpus turbinatus Gaertn. f., and *Mallotus paniculatus* Muell. Arg.. In *Crypteronia paniculata* stand, *Crypteronia paniculata* occupied mostly in crown cover and in some places *Cratoxylum ligustrinum* Blume, *Emblica officinalis* Gaertn., and *Lannea coromandelica* (Houtt.) Merr.are mixed with them. The ground cover is dominated by *Chromolaena odorata* (L.) R. M. King & H. Robinson, *Thysanolaena maxima* (Roxb.) Kuntze, *Getonia floribunda* Roxb. *Lannea coromandelica* stand mainly composed of *Lannea coromandelica*,mixing with*Cratoxylum ligustrinum* Blume, *Emblica officinalis* Gaertn., and*Schima wallichii*. The ground cover is mostly dominated by *Ageratum conyzoides* L..In the *Dipterocarpus turbinatus* forest, *Xylia xylocarpa* (Roxb.) Taub., *Heterophragma adenophylla* (Wall.) Seem., and *Ficus hispida* L. are occupied in crown layer. The ground cover is dominated by *Clerodendrum infortunatum* Gaerth., and *Cratoxylum ligustrinum* Blume.In *Mallotus paniculatus* stand, *Dolichandrone* sp., *Terminalia bellerica* Roxb. and *Heterophragma adenophylla* (Wall.) Seem.,are mixed in crown layer. The ground cover is dominated by *Abelmoschus ficulneus* (L.) Wight & Arn. ex Wight.

Discussion and Conclusion

A total of 111plant species representing 90 genera and 46 families were recorded in the study area. The dominant tree species in the rain forest were *Crypteronia paniculata* Blume, *Lannea coromandelica* (Houtt.) Merr., *Dipterocarpus turbinatus* Gaertn. f., and *Mallotus paniculatus* Muell. Arg.. The ground cover is mostly dominated by *Chromolaena odorata* (L.) R. M. King & H. Robinson, *Thysanolaena maxima* (Roxb.) Kuntze, and *Getonia floribunda* Roxb. The important value index is imperative to compare the ecological significance of species (Lamprecht, 1989). It indicates the extent of dominance of a species in the structure of a forest stand (Curtis and McIntosh, 1950). It is stated that species with the greatest important value are the leading dominants of the forest. Accordingly, the five leading dominants in study area were *Crypteronia paniculata* Blume, *Lannea coromandelica* (Houtt.) Merr., *Dipterocarpus turbinatus* Gaertn. f., *Mallotus paniculatus* Muell. Arg.and *Careya arborea* Roxb. contributing highest IVI value (31.258, 24.351, 16.721, 16.344, 15.540) respectively. Those tree species could be considered as ecological indicator species of the Mountain forest.

Diversity indices are commonly used to assess the state of an ecosystem (e.g., as a criterion for conservation evaluation), with high diversity generally being considered a desirable property in a community or ecosystem. The value of diversity indices and evenness indices of Mountain forest showed r low. Diversity value for all sample index of Shannon Wiener index (H) is 3.138, Simpsons index (D) is 13.176, Brillouin (D) is 2.956. Species distribution by frequency classes showed that 77.08% of the total number of species was in lower frequency classes, A and B, while only 22.92% was observed in higher frequency class C, and 4.17% in both D and E. It indicates that the forest of Mountain forest is floristically heterogeneous.

The forest structures in the study area show all types of disturbance. The area has a less protection status that allows the exploitation of natural resources; such as illegal logging, firewood collection, and conversion to cultivated land.

Terriestrial Fauna

Fauna in the Mangrove Forest

The Coastal Mangroves in Taungup Township are part of the degraded mangrove systems in the country. The mangroves have also been overexploited. The wild species have been severely reduced but hang on in isolated pockets. Several mammal species occur in this Eco-region but in small and scattered populations. The otter (*Lutra* spp.) were reported by locals but probably have been extirpated or survive only in low numbers.

Typical Otter (Lutra Spp.) (species.nbnatlas.org)

Bird life in the mangroves is rich in migrants and resident waterbirds. A few resident waterbirds include the Indian pond heron (*Ardeola grayii*) little cormorant (*Phalacrocorax nigers*), and heron (*Egretta* spp.).

Typical Indian Pond Heron (www.hbw.com)

Mangrove forests are subject to severe degradation because there is no clear-cut land-use system. Forestlands have been converted to agriculture and other development activities. Mangroves are being intensively cut for firewood, charcoal burning, and non-timber produce. Some mangroves are converted to fish and prawn aquaculture to meet the demand of an increasing population

Fauna in Coastal Rain Forests

The Myanmar Coastal Rain Forests are a diverse set of climatic niches and habitats that include flora and fauna from the Indian, Indochina, and Sunda region. Though low in endemism, this ecoregion has great species diversity. However, the forests have been increasingly destroyed to make way for agriculture, and poaching has become the dominant threat to the remaining wildlife populations

Fauna in Mountain Forests

The area includes the forest cover of Mountain Forests with relatively high bird species richness. This large ecoregion also represents the semi-evergreen sub-montane rain

forests. Predominant shifting cultivation practices cause degradation of the landscape in line with the nature of land transformation.

Threatened wildlife animals of the area include Chinese pangolin *Manis pentadactyla*, which is endangered species. Keeled box turtle *Pyxidea mouhotii* and Myanmar roofed turtle are recorded as endangered species of reptiles. A bird species, Great Hornbill *Buceros bicornis* was also recorded as near-threatened species.

In the area, the products, as provisioning services, obtained from ecosystems are different kinds of food, which include the vast range of food products derived from plants and animals. Other products are fiber, fuel, natural medicines, pharmaceuticals, and ornamental resources. Fuels are wood and other biological materials serve as sources of energy. Ornamental resources are animal and plant products, such as skins, shells, horns, antlers and flowers. Most butterfly species are also helping in pollination at both forests and cultivated lands. The recorded animals and diverse fauna and flora of the proposed project area are, therefore, parts of the ecosystem providing regulating services for human well-being

Species Diversities of Birds and Butterflies

The Shannon species diversity index values of species for diversity birds was recorded as high in Mountain forest and low in mangrove forest. Shannon's evenness values of the regions showed that the bird species are evenly distributed in the areas.

The highest species diversity value of butterflies was recorded in Mountain rainforest, and Coastal rainforest. Shannon's evenness value indicated that the butterfly species distributed evenly in all regions. This result agreed with the analysis result of distribution pattern that showed the random distribution.

Relative species diversity values of birds in the areas

Diversity Index	Mangrove Forest	Coastal Rain forest	Mountain forest
Shannon H' Log Base 10.	0.996	1.016	1.056
Shannon J'	0.847	0.887	0.858

Relative species diversity values of butterflies in the areas

Diversity Index	Mangrove Forest	Coastal Rain forest	Mountain forest
Shannon H' Log Base 10.	1.255	1.266	1.386
Shannon J'	0.91	0.958	0.948

Deforestation and Loss of Biodiversity

Deforestation stands as a major environmental threat in Taungup region. Most of the primary and pristine forest coverage has disappeared due to long uncontrolled logging activities, unplanned use of land and extraction of resources.

Mangrove along the coastal areas which once acted as natural barriers to storm surge has also been depleted due to massive illegal charcoal and wood production over decades. It is reported that in the years of military government, large scale timber extraction was conducted by local business men tied to local governmental officials and the military regime. Huge swaths of the monsoon forest are being cleared for farming and human settlement. As a result, Rakhine mountain ranges once richly covered with thick monsoon forest have turned to bare land on which only secondary woodland are growing. Weak environmental governance and lack of institutions has contributed to the illegal logging activities, which finally leads to irreversible environment degradation.

The total mangrove forest area in 1990 was 407 hectares, which accounted for 0.57 percent of the township. It has decreased to 236 hectares or 0.4 percent of the township in 2005. Within 15 year period from 1990 to 2005, the mangrove forest area converted into other types of land use such as paddy field (110 hectares) and scrub land area (34 hectares).

Figure 6 Log Stock Pile in Taungup (May 2014)

The loss of habitat for the local flora and fauna species has been accelerated along with deforestation. Widespread illegal hunting and illicit wildlife trading is quite common in the region. The local ecosystem has been depleted for years. The increasing pressure on ecosystems and habitat loss due to human encroachment and deforestation in the area has resulted in gradual species loss. This issue has been significant over the last 20 years. The area once proudly claimed by local people as a place with rich natural resources is gradually becoming an environmentally degraded area. Over exploitation of natural resource through wood collection, logging and hunting still pose a major threat.

The forest area cover of the township is 57688 hectares or 81.29 per cent of the township area. The area covered with tropical mountain forest containing major species like Kanyin (Dipterocarpus spp), Pyinkado (Xyliadalabrifmis), Kanyaung (Shorea argentea), Binga (Murogyna rotindifolia), Pyinma (lagerstroemia speciosa), Myaukchaw (Homalium momentous), Taw-Thayet (Mangier calenture), Tangerine (Archicarpus calphyla), Kadet (Crater religious) and Taung-me-ok (Latonia scholars), have been utilized by Myanmar Timber Enterprise, private companies and local people during the last 25 years. Timber extraction under the control of the Forest Department was carried out in the reserve forests in the township area. According to conservation estimates, mature trees at breast height (GBH) 6 feet and up had to be extracted. Within 12 years from 1993 until 2005, 31,161 trees were extracted by the government in Taungup Township. Although extraction of logs differed every year in the township, at least 311,61 trees could be considered lost. Extracted logs over the whole township were 91379 cubic tons in during 1993 through 2005 while no data for last decade is disclosed.

Figure 7 Forest Clearance and Shifting (May 2014)

Other common activities which compounds the loss of diverse ecosystems and forest areas grazing, fuel wood collection, expanding agriculture and growing population. Since no power grid is available in the region, local residents entirely rely on fire wood as fuel for cooking and timber and bamboo for building their house for generation to generation.

3.2 Socio Economic and Ethnicity

General Background

According to township administrative record (2014 March), there are 143,802 people living in the township and 20 per cent of the total is in urban area of Taungup and Ma-Ei towns. 285,46 people are noted to be under poverty line (less than 1000 Kyats income per day) and so the poverty rate is 20%.[5]

People access water mainly from rainwater ponds and local hand dug wells while most of the rivers have tidal influences. There is still no power grid to the township and

[5] Township Administration Record(2014)

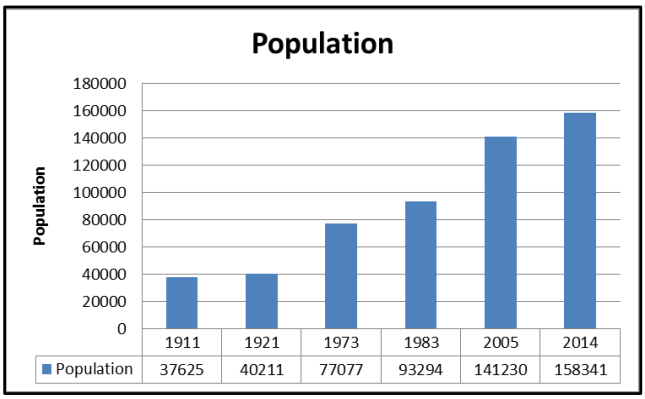
urban area use electricity from local fuel-generators. The requirement for the township is about 3000 kilowatt but to date only 700 kilowatt is received.

Rice production is done in low land plains. Food production is sufficient for the township where 4785550 standard baskets of rice were produced in the township's fields while the required rice is only 2043657 baskets. Rice and fisheries are key products of the township.

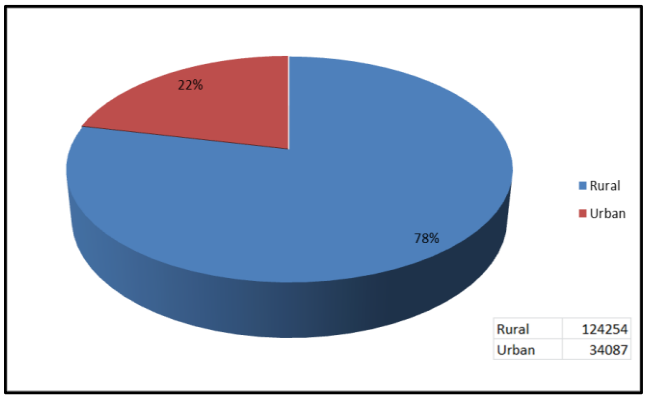
To date, tourism is not an important business for the township though the area is a transportation hub for foreign visitors taking the port side express between Sittwe, the city of Rakhine Coastal Region, and Taungup.

Population

Population is one of the basic factors for social environment of a region. In 2014, total population of Taungup Township (including Ma Ei Sub Township) is 158341 with 77,257 males and 81,084 females.



The population in Taungup Township is mainly distributed in the lowland area of watershed where fisheres and agriculture are practiced together. In the hills, spurs and mountain around reserved forest area of eastern part of Taungup Chaung watershed area, population is sparsely settled .On the other hands, population is dense on the plains, lowland and riverside where transportation and economy is well developed.[6] According to the population figure, number of population is gradually increasing.



Ethnicity and Religion

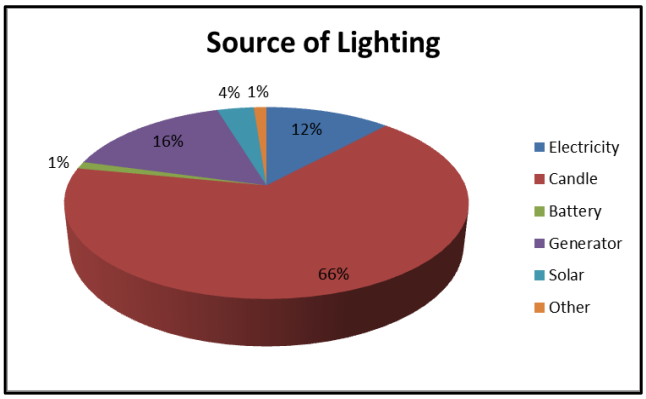
The majority of the people who live in Taungup are Rakhine. Other ethic includes Bamar and Chin etc. There are over 80 per cent of total population of Taungup where settled in the low lying village tracts as Wetkyeik, Kaingshe, Migyaungtoe, Natmaw, Thaleinpyin, Yanmyo and Taungywa. Chin ranks second next to Rakhine in total number. They live in cluster on the spurs of Rakhine Yoma in the eastern part of

[6] San San Khine, Assessment of Human Impact on Taungup Chaung Watershed Area

Taungup. Most of the rural people in upland area are Chin ethnic people practicing their age-old traditional shifting cultivation with their indigenous technology knowledge. Most of the local people in Taungup Township are Buddhists. [7]

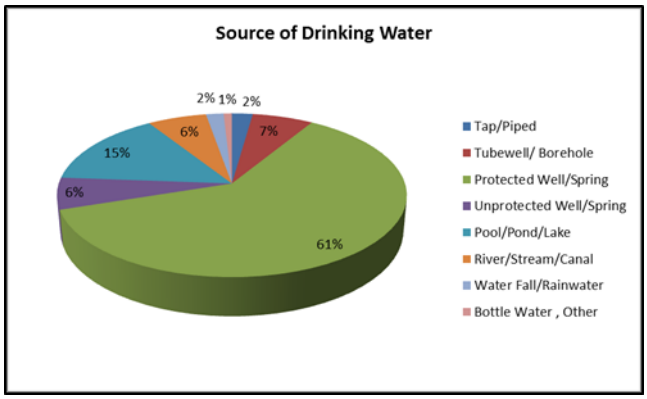
Energy Use for Lighting

According to 2014 census, there are altogether 35192 house holds in Taungup and Ma Ei Sub Township. Only 12% of total households can access to power grid. Rest of households depends on other types of sources for lighting purpose.



Soure of Drinking Water

Some urban area is accessable to the public water distribution system through pipe network . Water distribution network is available for some households in urban. However, rural communities totally depend on well, rain water pond and stream for both drinking and non-drinking. 61% of total households depend on protected well and spring for drinking water use.



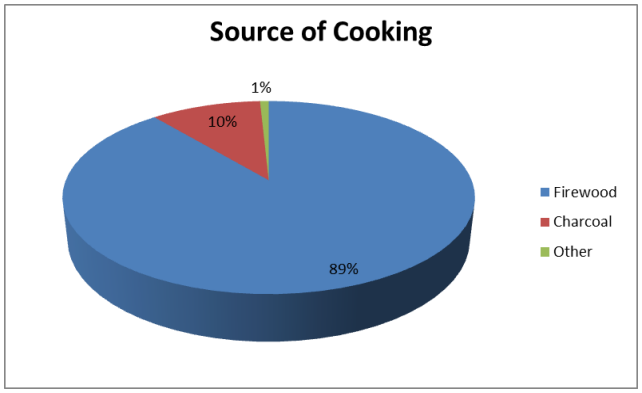
People from some villages (e.g. Kalayaung and Gye Wa villages) mentioned the requirement of rain water ponds for water storage would ease water scarcity as villagers currently had to find and collect water source in far off areas including collection of spring water from the mountainous region.

[7] San San Khine, Assessment of Human Impact on Taungup Chaung Watershed Area

	
Protected Dug Well	Resevior

Source of Cooking

Major source of cooking in the region is fire wood with 89% of total households use for daily cooking. Other sources are charcoal (10%) and electricity (1%) . Therefore, larve volume of firewood is required to supply the demand in cooking .



Road Network

Transportation is the most important infrastructure for the social and economic development of a region. There are 4 main highway roads in Taungup Township which are connected to neighboring areas such as Yarma, Kintaung, Maei and NaPinMa.

Other roads include roads connecting Taungup and other towns and roads connecting local areas. There are four main roads connecting Taungup with other areas are Taungup-Thandwe Road, Taungup-Pyay Road, Taungup- MaEi Road ,and Taungup-Ann Road. Road which is connecting between local areas is Mee-Chaun-Htoo-Yammyo Road.

Economic Activities and Livelihood

Major economic activities of Taungup Township include extraction of forest products, agriculture, livestock breeding, fisheries, and small scale domestic industries.

The likelihood in the urban area is fairly diverse, whereas most rural dwellers are engaged in the primary production activities. The majorities are farmers and fishermen, and others are mud-crab collectors, livestock breeders, gardeners (fruit trees, flowers and nipa), firewood cutters, traders and casual laborers.

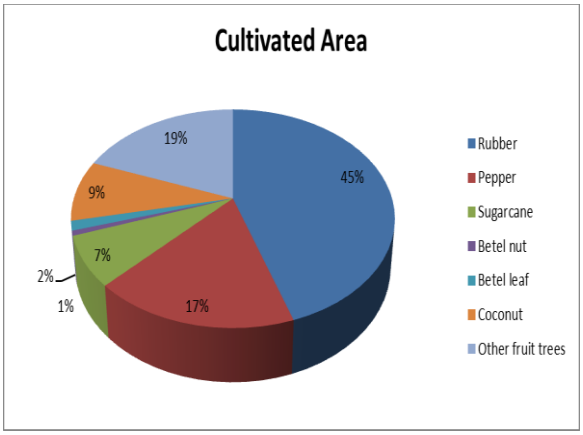
Taungup Township, being part of the Rakhine coastal , is replete with creeks, stream and rivers. The major streams which drain through the township are the Taungup, Tanlwe, Sabyin, Lamu and Ma-I taking their sources over the Rakhine Yoma. A number of streamlets join these rivers. Which are favorable habitats for fish, prawn and other aquatic animals. Therefore, fishery is the second most important economic activity of the Taungup area. As the sea fronts it, off-shore fishery is also important. Fresh fish and prawns are sold near the inn area or in the town or are sent to Yangon. Fish catch become low due to the destruction of mangrove forests. The private carries out offshore fishery, particularly by those who are residing in the coastal villages.

Mangrove ecosystems are important for inshore and offshore fisheries. The mangrove forests are areas where fish, prawns, and crabs (marine animals) feed on their nutrients as well as heir breeding ground and mangroves forests lands marine animals breed well. They supply organic matter and nutrients through a variety of flora, while providing nurseries and shelter for important marine stocks. Making of some fishing instruments and shrimp culture are one of the chief causes of mangrove forest depletion. In the past only hooks and fishing nets are used in casing fish. Later, with the increasing population, the method and instruments used have become more diverse. For making certain fishing instruments (Conical fishing net, Pole holding net, Fish-trap, Fence fish-trap and Jelly fish pond), the necessary wooden poles are extracted from the mangrove forest.

Main forest products are wood, charcoal, bamboo, cane, dani and honey. There is no exact data for wood production.

Agriculture, Livestock Breeding and Fishery

Main crops which are cultivated in Taungup Township are rice, bean, sesame, sunflower, and verities of beans. Rice and beans are the most important crops in agriculture of the township. Perennial and seasonal crops such as rubber, pepper, sugarcane, betel nut, betel leaf, and coconut are also grown in Taungup Township. The highest cultivated area is found for rubber wirh 45% (4090 acres) followed by pepper with 15% (1581 acres). Coconut cultivation is the third important perennial crop in this township.



Live stock breeding and fisheries is also important economic activities in Taungup Township. Buffalo, cow, goat, pig, and duck are the most important animals for husbandry.

Industry

The industry sector of the study area is not well developed yet and it has no industrial zone. The existing ones are agro-based, including mostly processing the agricultural produces. Among them rice-mills and saw-mills are the most common. Others are ice factory, workshop, cheroot rolling industry, furniture, blacksmith, goldsmith, and dhani sheets making industry. Garment (clothing) industry is the most important industry in the region.

Most of these industries are of small scale run by family members or with a few workers. Encroachment of industrializing process does not occur in Taungup Township. Thus, negative environmental and social impact caused by industrial sector is considered minor.

Salt Industry

Among the economic activities, salt production has less impact on the mangrove forest of the stud area although it also is one of the causes of mangrove forest depletion. In Myanmar, salt production by sun-drying began in 1963-64, and this practice spread rapidly over the coastal areas. By 1991-92 except some areas in Rakhine State and Taninthraryi Region, other coastal area produced salt b sun-drying method. Salt production by cooking salt water needs a large amount of fuel wood which causes forest depletion. In order to reduce the rate of forest degradation and depletion the production of cooked salt is prohibited.

Salt production by sun-drying needs no charcoal or fuel wood and it seems that it will help reduce the forest depletion rate. However, in production salt by sun-drying method it needs a considerable wide space of mudflats and clear cutting of a certain mangrove forest in the coastal area frequented by tidal action.

3.3 Environmental Issue and Analysis

During the scoping process, active development activities were identified and a matrix indicating the probable interaction between economic activities and environmental elements .Seven activities are regarded as the most active and would have considerable impacts on social and environmental resources of study area.

In this section, probable environmental impacts were examined in detail and assessment was made through desktop review and expert judgment.

The relationship between such activities and climate change consequences are also highlighted in each section.

Environmental Impact by Aquaculture Fishery

In Taungup Township, saltwater shrimp breeding is being carried out mostly by traditional method called extensive culture. Like creating paddy field, embankment around the chosen plot in mangrove forest has to be constructed and sluice gate is kept at the mouth of the stream. As mangrove species can not survive for long under fresh

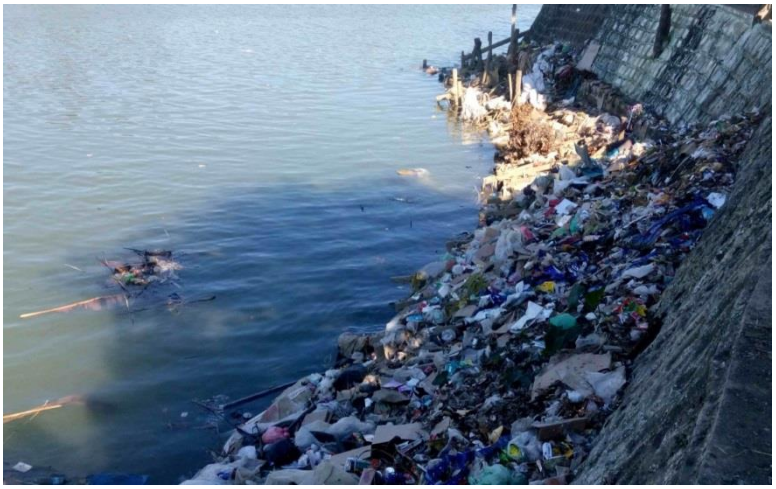
water, most of the trees die several weeks later. Then the trees are cut and removed from the plot. Usually the plot is filled with sea water in April. The sluice gate is attached with net or roll of bamboo chick to trap and hold the larvae and small young shrimp at spring tide periods with the raising tidal water. When the water is reached at optimum level the sluice gate is shut up to keep the shrimp within the pond.

Table 4 Aquaculture Fishery and Environmental Analysis

Element	Description
Current and Future Trend	Current trend is unknown
Environmental Impact	As the shrimp ponds are created within the mangrove forest, this activity contributes various environmenta impacts. • Depleting of mangrove forest and mangrove ecosystem • Loss of spawning ground of marine aquatic life • Impact on the aquatic food change • serve soil erosion • water quality degradation • Increasing hazard to aquatic and the change of coastline due to bank collapse.
Climate Change and Linkage Impact	Removal of mangrove forest could have loss of carbon sink, natural barriers and increase the intensity of tidal surge and flooding.
Recommendation	• Shifting traditional aquaculture to modernized aquaculture. • Avoidance on destruction of mangrove community • Restoration and rehabilitation of degraded forest and mangrove community by adapting new scheme

Environmental Impact by Waste Management

Like other cities and towns in Myanmar, waste management issue including collection and disposal in Taungup is a growing problem. There is no designated dumping facility in Taungup Township. Existing practice is that truck carries the municipal waste and dumps it along the road side and then burning is followed without any attendance or control .



This practice is totally unacceptable from social environmental and health aspects. Besides, there are no proper structures and facilities to facilitate waste for segregation and disposal. The existing sites is operating in a way that causes sanitary issues. No parameter boundary or fenced is installed to prevent unauthorized person and animal entering into the dumping location. Most importantly, plastic, rubber, battery, old tires and other harmful waste are not effectively segregated and all are burnt out on site.

In the absence of proper waste collection and disposal, people in the area practically dump the garbage in the nearby water bodies. Since Taungup Creek flows through the town, the creek suffers much of water pollution due to garbage dumping.

Township Development Committee which holds the responsibility pertaining to waste management has been struggling to deal with handling the issue.

Basic information, current and future trend, environmental and climate change impact and recommendations for waste management are summarized in following table.

Table 5 Waste Management and Environmental Analysis

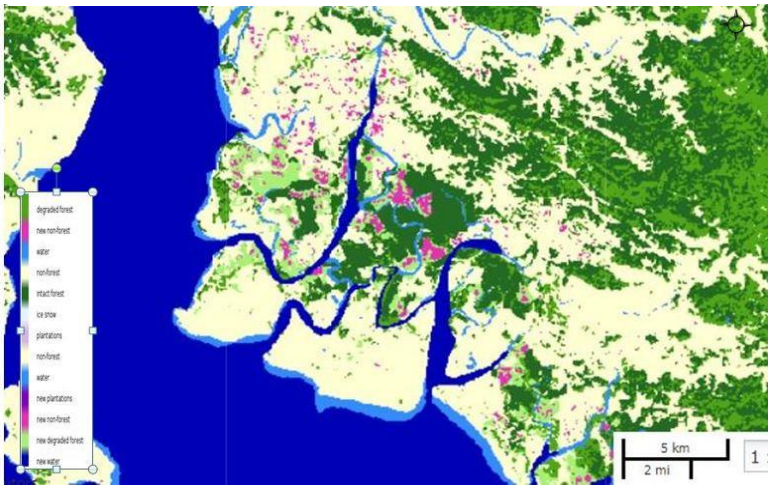
Element	Description
Current and Future Trend	Since population is gradually increasing, more waste is expected to be generating in the future.
Environmental Impact	A number of considerable environmental impact has been predicted as follows. ➢ Open burning of mixed household waste and other communal waste which consists of plastic debris is seriously harmful to the human health and air quality. Overall problems from existing waste management practices of Taungup town is expected to include: ➢ Toxic gases, particulate emission, CO2 and other global warming gases emissions into the atmosphere. ➢ Foul odor from burning and landfill ➢ Surface water and ground water and soil contamination ➢ Spreading infectious disease by vectors emanating from the landfill resulting in community health issues ➢ Various types of air pollutants giving rise from burning of mixed

Element	Description
	solid and hazardous waste can have a direct impact on the health of people living nearby the landfill and people working at dumping site and visitor coming to graveyard to attend funeral ceremonies. ➢ Health impacts can occur as a result of toxic pollutants such as dioxin, polystyrene, benzopyrene, particulate and carbonmoixide. ➢ Water Pollution and aqutic foodchain ➢ Taungup creek and other rivers bodies were contaminated with plastic and other debris. Water quality was degraded. As a result, aquatic life in marine and freshwater will be seriously deteriorated
Climate Change and Linkage Impact	Burning of solid waste does significantly contribute in deteriorating of local air quality, public health and finally global warming.CO2 is primary global warming gas emitted by open burning and methane emission is from landfill site. Improper burning practices will be worsening the accumulation of global warming gases.
Recommendation	➢ Establishment of composting plant. Composting of waste is anaerobic method of decomposing solid wastes. The process involves decomposition of organic waste known as compost which is a good fertilizer for plants. ➢ Study area needs a solid waste management plan to address issues generated by waste collection and disposal. Such plan should be prepared together with departmental organizations led by township development committee with assistance of waste management specialists. Improvement of waste collection systems including provision of sufficient waste collection bin along the Tso as to avoid throwing debris into river. ➢ Uncontrolled waste dumping in public area and reuse and recycling should be promoted through public environmental campaigns and with incentives ➢ Burning practices should be reduced by increasing landfill and compositing sites ➢ Designated waste burning sites and landfill should be strategically selected considering potential of water pollution, soil contamination and health issues ➢ Township waste management plan should be developed and implemented effectively

Environmental Impact by Shifting Cultivation and logging

The rapid growth of population due to high birth rate in the lower part of watershed area has resulted in reduction of fallow period. [8]Consequently it encourages extension of shifting cultivation into remote location. Finally, deforestation in watershed area of Taungup Creek is accelerated. This type ofcultivation is widespread in reserve forest area away from Taungup-Motor road. Most of these plots are left for years without replantation leading to the degradation of area.

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



Expansion of shifting cultivation hugely destroys natural evergreen forest of watershed area. F cover change, significant number of acres of forest has been converted into plantation andAgricultural land between 2002 to 2014. This happened in the northwest part of Taungup town.[9]

Table 6 Shifting Cultivation, Logging and Environmental Analysis

Element	Description
Current and Future Trend	Shifting cultivation has been extending in remote area.
Environmental Impact	*Deforestation* Deforestation causes loss of ecosystems, loss of flora and fauna species and habitats. Deforestation has been accelerating due to the excess extraction of timber and increasing upland farming and perennial plantation. *Soil Erosion* Deforestation is directly linked to the soil erosion, In the absence of trees in area, the valuable top soil layers are washed away with torrential rain flow and increase the sediment load of the receiving river. In addition, it improves the quality of water through root's

[8] San San Khine , Assessment of Human Impact on Taungup Chaung Watershed Area , Dept of Geography, University of Yangon

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

Element	Description
	filtration process by removing toxic chemical compound. *Water Shed Area* Loss of water retention and disappearance of water source the watershed area of Taungup Chaung and other streams *Bush Fire* Shifting cultivation is one of the major causes of forest fire. Most of the bush fires originate from burning of vegetation debris. Unattended and uncontrolled burning practice, intense heat and strong wind can lead fires to get out of control and spread.
Climate Change and Linkage Impact	One of the driving factors of climate change is deforestation and land use change. Forest is a natural carbon sink which absorbs carbon in form of carbon dioxide and emit oxygen which is vital for living of human being and animals. Open burning directly brings about the climate change by sending carbon dioxide and methane which are regarded as most harmful global warming gases into the atmosphere. On the other hand, deforestation induced by vegetation clearance is responsible of degrading the resilience of nature and biodiversity. Forest also play an important role in watershed management and can prevent landslides and floods through maintaining soil stability and ground water flow. Forests can play a major role in flood protection and climate change adaptation through ecosystem services.
Recommendation	Suggestion is made to initiate a program for data collection . In addition, allowing concession rights for perennial plantation should be considered the. ➢ Implementation of government's policy/ forest law and regulation on logging activities should be continuously complied. These measures could be achieved through cooperation of local community involvement. ➢ Monitoring illegal logging and tree cutting should be programmed. ➢ Slash and burning practices should be stopped through legal enforcement, awareness campaign and capacity building which will make local community understand the consequence of slash and burn practices.

Environmental Impact by Charcoal Burning and Firewood Collection

Charcoal burning is one of the most important causes of deforestation. Burners are mostly from squatter settlements in different wards of Taungup town. Their dwellings are on part of the foothill of Rakhine Yoma mountain ranges where the charcoal burning takes place. They are predominantly illiterate, and their main earnings come from charcoal making. When questioned during a consultation it was found out that of around ten out of the 25 or so families living on the trade, one of them was the largest in the trade with a 35-year service. Two are doing this job 20 years and the other 7 have been in this trade for 2 to 5 years.

Some of the charcoal burners responded how they want as far as Yankhaw, Nanda, Seikphyu and Yahu hills to collect firewood for charcoal burning. The firewood has to be of medium girth, about one foot circumference, and mainly of pyinkado wood. Other kinds of wood used as firewood for charcoal burning are Pyinma, Seikhee and Khamoung. For day trips of firewood collecting work each person has to collect about 20 chunks of 3 feet long, one-foot circumference firewood. This is because the charcoal thus produced from the above amount of firewood would be about 20 viss, which is a convenient load for one person to carry back home for sale. When clubs of wood are being burnt, piles of earth have to be secured at the ready to put out the fire at the required stage, that is, the wood clubs are transformed into charcoal. After covering with earth puts out the fire, some water additionally has to be sprayed over.

Some charcoal burners work on a daily basis while other work on 5 days cycles, tacking bullocks cart trips into the woods to obtain one cartload of charcoal. It can take up to 5 days of collecting wood clubs to collect one cartload of wood clubs. These charcoal burners have no formal registration with the government. The workshop season is the dry and open season from October to June. Once per month when the calculation is done on the basis of the using up 20 such clubs per working day, and 20 working a month, from which to get 400 viss of charcoal. The working season lasts about six months and thus one local charcoal burner uses up 2400 such clubs of wood. Where there are 20 people in Taungup Township earning such as living, the total three feet chunks would be to 48000. The average height of trees in question is 30 feet, it follows that Taungup Township must fell around 4800 trees annually for charcoal burning. In the same time, some charcoal burners cut mangrove forest for the inhabitants of the Taungup town as they prefer charcoal from mangrove forest for cooking than those from mountain forests. The charcoal produced out of firewood from the hill and mountain is mainly used by blacksmith and gold smith workshops but very little for cooking purposes

The use of fire wood as cooking source commonly practices in Taungup Township. As cooking source, 89 % of household uses firewood and 10% uses charcoal.

Table 7 Charcoal Burning, Firewood Collection and Environmental Analysis

Element	Description
Current and Future Trend	Since electricity supply in this township covers only very few area, rural which occupies more population have to rely on charcoal

Element	Description
	and firewood for cooking and some activities. Enforcement of forest regulations have been struggling, the trend of this activity is likely stable and tend to increase
Environmental Impact	Deforestation of rainforest, coastal mangrove community. loss of biodiversity , Soil erosion and loss of spawning ground for marine aquatic life
Climate Change and Linkage Impact	Deforestation of natural barrier to climate induced disasters, disappearance of climate regulation ecosystem.
Recommendation	➢ Enforcement existing regulations, enhancement of using energy efficient cooking stoves ➢ Seeking alternative energy source, explore sustainable hydropower projects and other options. ➢ Consideration of offgrid electrification in the remote area where has limited oppounities to access the main grid.

Environmental Impact by Extension of New Villages

In the township, four new villages: Yattawmu, Salu, Doenwesan and Nyaninglando were established in 1983. These villages are distributed along the Taungup-Yangon motor road on the eastern part of the watershed area. These villages were located at high altitude in the mountainous region, which are generally deemed too rugged for homesteads. The villages have been settled by migrants coming from Ngepe Township. The main reasons for setting up the village in the region was due to

- Availability of water supply in the dry season,
- The land was vacant and did not require payment to settle
- Institutional factors that allowed villages to be established in areas 34 kilometers away from Taungup town to Taungup-Padaung boundary.
- The area is easily accessible due to the Taungup-Yangon motor road.

When the villages were first set up, there were 20 homesteads in all villages, which increased to 134 homesteads by 2006. Establishment of these villages was the direct cause of deforestation in the region. Before 1983, this higher elevation of watershed area was covered with bamboo groves and forest. After establishment of villages, homesteads and agriculture areas were extended simultaneously into forest and bamboo areas. The forest area around these villages gradually depleted due to new settlement of homesteads and farmland extensions. Populations of these villages had increased steadily with more clearing of forested land for houses and agricultural land.

Yattawmu village is located along the Taungup-Yangon motor road, 34 kilometers away from Taungup towards the eastern part. The area was occupied by bamboo and forested land before the establishment of these villages. When this village was formed in 1983, there were only 5 homesteads along the Taungup-Yangon motor road. Each plot of residential area occupied half to one hectare. In 2006, the residential land plots of this village increased to 59 homesteads, which were not systematically arranged along the Taungup-Yangon motor road. Each household has a range of land ownership for shifting cultivation and gardening from 5 to 22 hectares. All households cultivate seasonal crops and raise vegetables in their garden. Total garden and crop land cover about 350 hectares around the village.

Salu village is located along the Taungup- Yangon motor road, about 43 kilometers to the east of Taungup town. When this village was formed in 1983, there were only about 5 households. In 2006, this village increased to 61 residential plots. The area occupied by forest and bamboo land has changed into settlement area. The distribution pattern of homesteads within this village has some facing the Taungup-Yangon motor road and some scattered along the paths, which spray out from Taungup-Yangon motor road. This path is about 8 feet wide.

Donwesan village is located immediately to the eastern part of Taungup and it lies about 56 Kilometers from the town. Although there were only 4 residential plots when the village was first established, it has increased to 23 land plots, a primary school and a church by 2006. Residential plots are systematically arranged and the size of these plots is very large because the backyards of the homestead are occupied with garden plantations. Therefore, it is difficult to divide residential land use and agriculture land use as these are mixed. The sizes of some plots are very small, due to rugged topography limiting to extension of homestead area. The forest area near this village

has been depleted by the extension of village area and farm lands. The population of the village has been rising steadily and this had resulted in increased clearing of forested area for agriculture and village residences. Due to this village is located above 1000 meters, for the availability of drinking water in dry season, local authorities of this village conserved the forest area along the upper part of tributary of Taungup River.

Nyaunglando village is located in the eastern part of the watershed area and it is 63 kilometers to the east of Taungup along the Taungup-Yangon motor road. This village was founded in 1983. In that year, there were only 5 homesteads in this village, all of which were distributed along the Taungup-Yangon motor road. It increased to 59 homesteads in 2006. The residential land plots have different sizes from half to one hectare. The homesteads are clustered in the village and agricultural land and garden are distributed toward the eastern part from the village. Bamboo and forest area before formation of the village was changed into banana, *danyin* and pineapple plantations and settlements.

Other informal sector settlements are found along the Taungup-Yangon motor road. This settlement has a scattered distribution of temporary huts.

Table 8 Extension of New Villages and Environmental Analysis

Element	Description
Current and Future Trend	With population gradually increase , the extension of new villages and urban area is foreseeable to continue
Environmental Impact	Sanitary issue, waste management, pressure to drainage system , deforestation and ground and surface water quality
Climate Change and Linkage Impact	Deforestation by encroachment of human settlement could reduce the carbon sink, ecosystem service such as climate regulation and resilience to disaster
Recommendation	➢ Systematic planning on extension of human settlement ➢ Prior to extension happen, construction of basic infrastructure such as drainage, road , electricity distribution, water supply ,building should be considered environmental and social impacts ➢ Selection of new location should be based on considerable distance from ecological sensitive area

Environmental Impact by Extension of Roads

Due to government policy encouraging rural development, Township council constructed new roads, streets and upgraded old roads after 1988. There are two main roads and three earthen roads in the township, belonging to Township Development committee. The two main old roads are Taungup-Yangon road and Taungup-Thandwe

road. The new earth roads are Taungup-Tarye road, Taungup-Hmanni road and Natmaw-Kaingshe road.

Table 9 Road Extension and Environmental Analysis

Element	Description
Current and Future Trend	Due to increase in use of vehicle and truck for communication, road extension is likely to increase in future
Environmental Impact	Since Taungup area is enriched with biodiversity and diverse ecosystem , road construction and entension would have significant environmental impact on the receiving environment. The extension of these earth roads could have caused the changing of transport land area. In before 1988, the transport land area 97.43 hectares and those to date is 101.6 hectares. Land grabbing and clearance of vegetation is major activities in the construction of road activities Assoiciated bridge constuction would temporary hinder the water flow of stream and river in the region.
Climate Change and Linkage Impact	Destruction of dense vegetation for road construction could damage the carbon sink and ability to regulate the climate
Recommendation	➢ Feasible alternative options are to be considered to avoid environmental and social sensitive area and to maintain livelihood of people ➢ Compliance to existing EIA procedures and other regulation is essential for these activities

3.4 Key vulnerabilities of communities in Taungup and Ecosystem Services

Major Environmental Threats and Vulnerability

Both rural and urban communities of Taungup Township experience a wide ranges of natural disasters including seasonal floods, intense heat, storm surge, land slide and, bush fire. Community of coastal area had experienced consequence of Tsunami in 2003. These natural disasters could have been worsen by the environmental impact of human activities.,

A numbers of adverse environmental impacts triggered by human activities are identified in the previous section. Amongst, environmental degradation such as air and water pollution, riverbank erosion and deforestation are considered to have much affected on vulnerable communities of the regions.

Drinking water scarcity is the consequence of intense heat, deforestation and river water pollution. Village communities residing on hilly regions are most vulnerable communities when it comes to drinking water scarcity after shortage do occur in summer especially April and May, the hottest months of the year.

Taungup Township has been experiencing seasonal flooding. Flood event becomes quite common in monsoon season. Villages located along the low land area and river bank including Taungup Town itself has frequently suffered this type of disaster.

Open burning of household waste, waste from business activities and other communal waste which contains plastic debris and other material could result in serious health problems to human health .Number health issues in local residents can be developed from toxic gases and particulate emission.

Carbon oxide from incomplete combustion could cause dizziness, head ache, affect mental function, visual acuity and alertness. Dioxins and Furans are very toxic and it may cause cance and affect immune and reproductive systems.[10] Dioxin is emitted by burning organochlor based plastic compound such as PVC (Poly Vinyl Chloride). Particulate matter can lead to irritation of respiratory tract and aggravated asthma. It also contributes to chronic obstructive pulmonary diseases.[11] Burning polystyrene releases Carbon Monoxide and styrene monomers into the environment, which can be extremely hazardous to health.[12]

Residual ash from burning site can be washed away by storm water and then brought into nearby water bodies. Ash containing toxic compounds could impair the water quality of both surface and ground water. Contaminant water can contribute to health problems such as typhoid in local community who rely on stream and tube well as water source. Open dumping site could be the place spreading infection disease through vectors. However, this is just estimation and people living outside of this defined boundary could also be affected to somewhat extent.

Throwing rubbish and discharging domestic and agricultural runoff and waste water into nearby river channels could contaminate water. Contaminated water can cause many water borne diseases such as typhoid, hepatitis A and cholera.

Ecosystem Service

Ecosystem service is service provided by ecosystems to human being. Ecosystem service is generally divided into four categories such as provisioning service, regulating service, supporting service and cultural service.[13]

[10] Health effect of burning municipal solid waste, Saskatchewan Ministry of Environment, www.environment.sk.ca
[11] Health effect of burning municipal solid waste, Saskatchewan Ministry of Environment, www.environment.sk.ca
[12] http://businessbarbados.com/trending/green-business/the-dangers-of-polystyrene/
[13] https://en.wikipedia.org/wiki/Ecosystem_services

Ecosystem in Taungup generally divided into different catagories such as forest, river, flood mangrove and wetland, cultivated land, urban area, high land and low land. Each ecosystem has unique characteristics in regulation on natural hazard and service to human being. For example forest ecosystem plays role in flood protection and soil loss prevention[14]. River and mangrove ecosystem provides food, water, agricultural land and transportation for human being.

Food

Rice is staple food of the people of Township. Paddy rice field can be observed in rainy season. Apart from paddy field, some seasonal and cash crop vegetables are grown on either on farmland, orchard or home garden. Livestock such as cattle, water buffalo, goat, chicken and pig are raised within household control. Principally, cattle and water buffalo are for agricultural purpose .Other livestock are for food and alternative income.

Fish is another source of food for the region. Marine fish and other aquatic creatures from Bay of Bengal are the essential for local people for domestic consumption and exporting to other regions.

Community of mountainous region relies on forest as their alternative food source collecting bamboo shoot, mushroom, vegetable and other foods.

Some degraded forest and shrub land have converted into commercial plantations. Mangrove Forest are converted to shrimp farming .These activities increase the attenuation of food availability from forest ecosystem to local residents through the disappearance of spawning grounds of marine aquatic creatures.

Thus, food security of the rural communities has been threatened by climate extremes, environmental pollution, development activities and deforestation.

Water Availability and Quality

Conventional dug water wells have been used for decades for drinking, cooking and other purposes. However, water availability from this creek is not commonly utilized due to possible water pollution and tidal influence .Hence, it is not usable for drinking purpose in the lower reach .However residents living unpper reach of Taunguk Chanung could use water for various purposes such as drinking and household utility as it is clean and fresh.

During the hot season, most of the villages suffer drinking water shortage and sanitation issues. Water aquifer becomes lowers, reservoirs and conventional dug becomes dried up in some places. Water availability from small streams cannot supply much water in the summer due to low water level. This water scarcity leads to spread of infectious diseases on local resident and animals.

[14] Environment and Vulnerability, Emerging Perspective, UNEP, ISDR

Vulnerable Communities

A number of township program and human activities have been identified, assessed the potential impacts and the mitigation measures are adapted in the environmental assessment section. Some environmental impact from those activities could have potential threats to the vulnerable communities of particular areas. Key vulnerable communities who livelihood and resilience are likely to be affected by increased business activities, development plan and climate change are generally identified .Following table summarizes the linkage between environmental aspect and most vulnerable community.

Table 10 Identified Vulnerable Communities in the Region

Environmental Aspect	Impact	Effect on Human Being	Vulnerable Community
Discharge of rubbish into water	Degradation of water quality Disruption of aquatic food chain	Water scarcity Less availability of fish Water use Health issues	Fishermen, Single led family, low income family, women and children, old people
Open burning of rubbish	Air pollution and fire	Health issues to near by resident and fire hazards	People especially children living in the vicinity of rubbish burning places
Deforestation and land use change	Loss of forest ecosystem service, Reduction the retention of water flow , Soil erosion and loss of fertile soil Riverbed increasing Increased sedimentation in water body , Loss of productive land and reduction the availability of food	Change livelihood of people Water scarcity Food scarcity Accelerate the frequency and magnetite of flood	People in hilly region People living downstream and low land
Landslide	Loss of vegetation coverage, loss of assets,	Temporary damage to transportation and communication	People in hilly region
Waste dumping	Drainage block, hygienic issue	Accelerate flood, spread of disease	Children, women and old people

Chapter 4 Generic Environmental Management and Recommendation

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

The study team stresses the requirement for all action to be carried out in a manner which will lead to harmonization of environment, economy and social values of Taungup Township. Recommendations are focused around the exiting activities that are deemed to have significant environmental impacts in the township. The recommendations are further linked to activities and highlight responsibilities and institutional requirements to implement the activities. It is acknowledged that no all actions can be implemented immediately. It is intended that the detailed implementation plan will be developed as part of the township implementation consultation process.

It is the responsibility of regional government agencies to take into consideration and integrate of these management measures into the existing activities and prior to any new activities in consultation with local government and stakeholders as a key factor in the implementation of sustainable development. In this regard, stake holder consultation is proposed to be performed for all project level activities or plans with full information disclosure encouraged.

As this document is an advisory document to government agencies to consider environmental and social aspects into the existing and future programs and projects, allocation of the responsibility and accountability is excluded.

4.1 Institutional Arrangement

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

Strengthening of institutional capacity

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

General Recommendation for Major Actors

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

Recommendations for Government

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

this report

10. Baseline data for water quality from Taungup Chaung and air quality should be collected to serve as basic reference

Recommendation for Industry and Business

11. Improvement in public participation and consultation in project development phase of new projects and activities
12. Initiate transparency and openness about project and business operations with publication of environmental, health and safety standards and policies.
13. Share information and findings of how businesses activities will affect community services and systems (food, water, energy, health etc.) and their resilience to climate extremes and environment and establish a mitigation plans
14. Encourage business investment in service provision and business practices that will improve the availability of resilience services to communities that will also contribute to economic development and profit margins (e,g agricultural services, community infrastructure, energy and water services etc).
15. Development community health and safety initiatives along with occupation health and safety program
16. Prioritize environmental conservation and pollution prevention mechanisms in business operations
17. Develop project specific environmental management framework with local government departments and implementation in accordance with existing EIA guidance and laws
18. Adopt environmental training program to operatives to ensure the service and activities undertaken by business do not adversely affect the resilience of local communities and the environment
19. Initiate Corporate Social Responsibility programs by enterprise focusing on enhancement of community resilience, protection of ecosystem service and environmental management

Recommendation for Community and Civil Society

20. Actively participate in stakeholder consultation and business meetings
21. Share local knowledge and experience in the consultation meeting and express concerns and challenges
22. Actively participate in environmental campaigns to be initiated by government organization and other organizations
23. Develop a private sector oversight mechanism that tracks adherence to environmental laws and procedures of all new development activities and projects
24. Oversee development and implementation of generic environmental management and encourage accountability and transparency in business and development practices

Table 11 Recommendation Table

Sr.	Environmental Category	Recommendation	Benefit to Environment, Ecosystem Management , Climate Change Mitigation , Adaptation and Resilience
1.Aquaculture Fishery			
1A	**Biological environment**	➢ Shifting traditional aquaculture to modernized aquaculture. ➢ Avoidance on destruction of mangrove community ➢ Restoration and rehabilitation of degraded forest and mangrove community by adapting new scheme	• Conservation of Mangrove Community and maintaining food security provided by ecosystem
• **2.Waste Management**			
2A	**General**	➢ Study area needs a solid waste management plan to address issues generated by waste collection and disposal. Such plan should be prepared together with departmental organizations and stakeholders led by township development committee with assistance of waste management specialists. ➢ Stop uncontrolled waste dumping in public area and reuse and recycling should be promoted through mor effective public environmental campaigns and with incentives ➢ Designated waste burning sites and landfill should be strategically selected considering potential of water pollution, soil contamination and health issues	• Improve waste management infrastructure • Improve environmental awareness • Reduce flooding • Reduce health risk • Improve waste management practice • Minimize health impact • Strengthening the cooperation of public iwaste handling
2B	**Ecological**	➢ Compositing plants (mini) should be considered collaboration with technology and financial support	• Improving infrastructure and protection of soil and water

Sr.	Environmental Category	Recommendation	Benefit to Environment, Ecosystem Management , Climate Change Mitigation , Adaptation and Resilience
	environment	from international aid agencies	pollution • Improve use of organic fertile residue from compositing plants
2C	**Landscape and aesthetic value**	➢ Feasibility study for compost plants to minimize the area required for landfill	• Reducing land use and maintaining landscape feature
2D	**Air quality**	➢ Waste burning practices should be restricted	• Minimizing the emission of air pollutants
2E	**River ecosystem and water quality**	➢ Throwing all types of waste into Taungup river should be strictly controlled ➢ Provide sufficient waste collection bin along the Taungup River so as to avoid throwing debris into river.	• Improvement in river water quality and minimize impact to aquatic life of river. Enhancement of food security of local community • Improve drainage function and reduce flooding from runoff
2F	**Public Health and Safety**	➢ Separation distance of landfill site to be defined considerable distance from public space, residential area ➢ Uncontrolled waste disposal in public and other areas should be reduced through public campaign	• Minimizing the contact between waste dumping site and public area to ensure the public health of community is secure
• **Shifting Cultivation and logging**			
3A	**General**	➢ Implementation of government's policy/ forest law and regulation on logging activities should be continuously complied. These measures could be achieved through cooperation of local community	• Protection vegetation clearance , increasing food security of local community , and increase resilience of local community to

Sr.	Environmental Category	Recommendation	Benefit to Environment, Ecosystem Management , Climate Change Mitigation , Adaptation and Resilience
		involvement. ➢ Monitoring illegal logging and tree cutting should be programmed.	climate extremes
3B	**Ecological environment**	➢ Slash and burning practices should be stopped through legal enforcement, awareness campaign and capacity building which will make local community understand the consequence of slash and burn practices	• Strengthening institutional framework. Maintain the ecosystem of specific area • Improvement of data inventory process of township. Raising environmental awareness
3C	**Air Quality**	➢ Open burning of debris of felled tree and undergrowth should be restricted.	• Minimizing the emission of air pollutants • Legal compliance
3D	**Livelihood**	➢ Conventional shifting cultivation should be moved forward to modernized agricultural practices focusing minimum amount of land requirement and maximum yield production ➢ More efficient sustainable agricultural practices with less chemical should be adopted which will also be adapted to climate shock and stress.	• Securing food security, sustaining livelihood. • Improvement in agricultural practices. • Avoidance of land acquisition and land conflict issues • Resilience agricultural practice
3. Charcoal Burning and Firewood Collection			
4A	**General**	➢Enforcement of existing regulations ➢Enhancement of using energy efficient cooking stoves ➢Seeking alternative energy source, explore sustainab hydropower projects and other options	• Lessen the loss of biodiversity and • forest coverage
4. Extension of New Villages			

Sr.	Environmental Category	Recommendation	Benefit to Environment, Ecosystem Management , Climate Change Mitigation , Adaptation and Resilience
5A	**General**	➢ Systematic planning on extension of human settlement ➢ Prior to extension happen, construction of basic infrastructure such as drainage, road , electricity distribution, water supply ,building should be considered environmental and social impacts ➢ Selection of new location should be based on considerable distance from ecological sensitive area and avoidance of possible landslide and flooding area	• Improve public health and avoidance of losing biodiversity
6. **Extension of Road Network**			
6.A	**General**	➢ Feasible alternative options are to be considered to avoid environmental and social sensitive area and to maintain livelihood of people ➢ Compliance to existing EIA procedure and other environmental and social related regulations and guidances	• Reduce the destruction of vegetation coverage ,
• **7. Climate Change and Ecosystem Management**			
7A	**General**	➢ Promote awareness level through environmental campaign in community highlighting the importance of ecosystem services and its relation to community resilience and climate change ➢ Review both Community Resilience Assessment Reports produced under BRACED to identify climate change and disaster shocks and stresses and further impacts caused by ongoing development activities.	• Improve ecosystem service • Improve community resilience

Sr.	**Environmental Category**	**Recommendation**	**Benefit to Environment, Ecosystem Management , Climate Change Mitigation , Adaptation and Resilience**
		➢ Enhance the resilience of most vulnerable communities of Taungup through maintenance and improvement of the good ecosystem service of natural biodiversity by channeling small grants and funds to joint community and government environment and ecosystem management projects.	

အခြေခံ ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲနှင့် အကြံပြုချက်များ

ဤကဏ္ဍတွင် တောင်ကုတ်မြို့နယ်၏ အုပ်ချုပ်သူများအနေဖြင့် ပတ်ဝန်းကျင်အားစီမံခန့်ခွဲမှုပြုလုပ်ခြင်းအားဖြင့် ပတ်ဝန်းကျင်ဆိုင်ရာ ဘေးအန္တရာယ်များကို လျော့ချနိုင်ရန်အတွက် အကြံပြုမှုများ နှင့် အစီအမံများကို ဆွေးနွေးတင်ပြထားပါသည်။အကြံပြုချက်များကို ပတ်ဝန်းကျင် ထိန်းသိမ်းကာကွယ်ခြင်း၊ အသက်မွေးမှုလုပ်ငန်းများကို ထိန်းသိမ်းခြင်းအပြင် ဒေသခံလူထု၏ ဘေးဒဏ်ခံနိုင်ရည် စွမ်းကို တည်ဆောက်ပေးခြင်း တို့တွင် ထည့်သွင်းစဉ်းစားနိုင်ပါသည်။

ဤ မြို့နယ်အခြေခံ ပတ်ဂန်းကျင်ဆန်းစစ်ခြင်းအစီရင်ခံစာ ပြုစုရာတွင် လေ့လာရေးအဖွဲ့သည် တောင်ကုတ် ဒေသ၏ သဘာဝ ပတ်ဝန်းကျင်ဆိုင်ရာ၊ စီးပွားရေး နှင့် လူမှုရေး ဆိုင်ရာ တန်ဖိုးများကို ညီညွတ်မျှတစွာ စဉ်းစားနိုင်စေရေး အတွက် လိုအပ်သော လုပ်ဆောင်ချက်များကို အထူး အလေးထား စဉ်းစားထားပါသည်။ ဒေသအတွင်းရှိ ရှိရင်းစွဲ လုပ်ငန်းများနှင့် ဖြစ်နိုင်ခြေအနာဂါတ် လုပ်ငန်းများမှ ပတ်ဂန်းကျင်ထိခိုက်မှုများကို တင်ပြထားပါသည်။ လုပ်ငန်းများ အကောင်အထည်ဖော်ရာတွင် တာဂန်ရှိသည့် အဖွဲ့အစည်းများနှင့် တာဂန်ယူမှုနိုင်မှုများကို လည်း ချိတ်ဆက်တင်ပြထားပါသည်။ သို့သော်လည်း အကြံပြုချက် အားလုံးသည် ချက်ခြင်း အကောင်အထည်ဖော်ရန် မဖြစ်နိုင်သေးပါ။ ထို့အတွက်ကြောင့် ရေရှည်တွင် အသေးစိတ်အကောင်အထည်ဖော်ဆောင်ရွက်မည့် အစီအစဉ်ကို မြို့နယ်၏ ဆွေးနွေးတိုင်ပင်ရေး လုပ်ငန်းစဉ်အတွင်း ထည့်သွင်းစဉ်းစားရန် ရည်ရွယ် ထားပါသည်။

လုပ်ငန်းများ၏ ဆိုးကျိုးသက်ရောက်မှုများကို ရှောင်ရှားရန် (သို့) အတတ်နိုင်ဆုံးလျော့ချရန် ရည်သန်သည့် ဤ အကြံပြုချက်များကို တင်ပြထားပါသည်။ ဤ အကြံပြုထားသော အစီအမံများကို မြို့နယ်၏ လက်ရှိ (သို့) အနာဂတ်မူဝါဒ၊ စီမံကိန်းများ၊ စီမံချက်များ တွင် ထည့်သွင်းအသုံးပြုသင့် ပါသည်။

အဆိုပြုထားသော ဒေသဆိုင်ရာစီမံခန့်ခွဲမှုအစီအမံများကို လက်ရှိလုပ်ငန်းများ နှင့် ဖွံ့ဖြိုးရေးဆိုင်ရာ မူဝါဒများ နှင့် စီမံကိန်းများအစပြုရေးဆွဲရာ အဆင့်များတွင် ထည့်သွင်းစဉ်းစားရန်မှာ ဒေသဆိုင်ရာ အစိုးရ၏ တာဝန်ဖြစ်ပါသည်။ ထို့အပြင် မည်သည့်လုပ်ငန်းမဆို လုပ်ငန်းများ မစတင်မီ တာဂန်ရှိသူများ၊ အများပြည်သူများနှင့် ဆွေးနွေးညှိနှိုင်းခြင်းသည် ရေရှည်ဖွံ့ဖြိုးတိုးတက်မှုအတွက် အဓိကကျသော အချက်တစ်ချက်ဖြစ်ပါသည်။ ထို့ကြောင့် ဆွေးနွေးညှိနှိုင်းခြင်းများကို စီမံချက် (သို့) စီမံကိန်းအဆင ့်လုပ်ငန်းတိုင်းတွင် ပြုလုပ်ပေးရန်အကြံပြုပြီး သတင်းအချက်အလက်များ အပြည့်အစုံထုတ်ပြန် ကြေညာမှုအား ပြုလုပ်ရန်လည်း တိုက်တွန်းပါသည်။

ဤအစီရင်ခံစာသည် အစိုးရဌာနများ အနေဖြင့် လက်ရှိလုပ်ငန်းများအတွင်း ပတ်ဂန်းကျင်ဆိုင်ရာ စဉ်းစားရမည့် အချက်များကို ထည့်သွင်းနိုင်စေရန် အကြံပေး လမ်းညွှန်ချက်များသာဖြစ်ပြီး တာဂန်ခွဲပေမှုနှင့် တာဂန်ယူမှု အပိုင်းများကို အစီရင်ခံစာအတွင်း ထည့်သွင်းထားခြင်းမပြုထားပါ။

အဖွဲ့အစည်းများ၏ အစီအစဉ်

ဒေသအတွင်းရှိ ကဏ္ဍအလိုက်လုပ်ငန်းများ၊ ဖွံ့ဖြိုးရေးစီမံကိန်းများ ပတ်ဂန်းကျင်နှင့်လူမှုရေး စံနှုန်းများ၊ ကျင့်ဂတ်များနှင့်အညီ၊ပြဌာန်းထားသော ဥပဒေများနှင့်အညီ လုပ်ကိုင်ဆောင်ရွက်ရန်အတွက် အထွေထွေ အုပ်ချုပ်ရေးဦးစီဌာန၊ ပတ်ဂန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန နှင့် အခြားသက်ဆိုင်ရာ ဌာနများတွင်တာဂန်ရှိပါသည်။ ဖွံ့ဖြိုးရေး လုပ်ငန်းများ ကြောင့် ဖြစ်ပေါ်လာနိုင်သော ပတ်ဂန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ဆိုးကျိုးသက်ရောက်မှုများကို စဉ်းစားထားခြင်း စနစ်တကျ ပြုလုပ်ထားခဲ့ခြင်းမရှိပါ။ ဌာဆိုင်ရာများ အတွင်းနှင့် ပုဂ္ဂလိကများအတွင်း ပတ်ဂန်းကျင် ကိစ္စများနှင့် ပတ်သတ်၍ ပူးပေါင်းဆောင်ရွက်မှု အတန်ငယ်အားနည်း နေဆဲဖြစ်ပါသည်။ ထို့အပြင် ဤကိစ္စများကို စောင့်ကြပ်ရန် မူဘောင်မှာလည်း အားနည်းနေပါသည်။ လုပ်ငန်းများ၏ ပတ်ဂန်းကျင်ဆိုင်ရာ ဆောင်ရွက်လုပ်ကိုင်မှုများကို စောင့်ကြပ်ရန်နှင့် ပတ်ဂန်းကျင်ဆိုင်ရာ စိုးရိမ်ပူပန်မှုများ ဖော်ထုတ်နိုင်ရန်အတွက် သက်ဆိုင်ရာ ဌာနများမှ ဂန်ထမ်းများကို ပတ်ဂန်းကျင်ဆိုင်ရာ လေ့လာစောင့်ကြည့်ရေးနှင့် ပတ်သတ်သော အရည်အသွေးဆိုင်ရာ သင်တန်းများနှင့် အခြားရင်းမြစ်များ ထောက်ပံ့ရန် လိုအပ်လျက်ရှိပါသည်။

အဖွဲ့အစည်းများ၏ စွမ်းဆောင်ရည်များ မြှင့်တင်ပေးခြင်း

လက်ရှိစွမ်းရည်များကို အခြေခံ၍အကဲဖြတ်ရာတွင် မြို့နယ်၊ ခရိုင်၊ တိုင်းဒေသကြီး၊ ပြည်နယ် နှင့် အဓိက ဗဟို အစိုးရအဖွဲ့အစည်းများတွင် ပတ်ဝန်းကျင်နှင့် သက်ဆိုင်သော အခန်းကဏ္ဍသည် ၎င်းတို့၏အစိုးရဝန်ထမ်းများအတွက် နယ်ပယ်အသစ် တစ်ခုဖြစ်နေပါသည်။ ထို့ကြောင့် တစ်ဦးချင်း နှင့် အဖွဲ့အစည်းတစ်ခုလုံး၏ စွမ်းရည်မြှင့်တင်ရန် ပိုမိုအားကောင်းသော ကြိုးပမ်းအားထုတ်မှုများလိုအပ်ပါသည်။

အဖွဲ့အစည်း အသီးသီးမှ ဆောင်ရွက်သင့်သော အကြံပေးချက်များ

မြို့နယ်နှင့်ပတ်သတ်သော အဓိက အဆုံးအဖြတ်ပေးသူများ အကောင်အထည်ဖော်သူများ ၊အကြံပြုထောက်ပြသူ အစိုးရအဖွဲ့အစည်းများ စီးပွားရေးလုပ်ငန်းစုများနှင့်အရပ်ဘက်အဖွဲ့အစည်းများအတွက် လုပ်သင့်လုပ်ထိုက်သော ပတ်ဂန်းကျင်ဆိုင်ရာ အကြံပေးချက်များကို အောက်ပါ အတိုင်းဖော်ပြထားပါသည်။

အစိုးရ ဌာနဆိုင်ရာ အဖွဲ့အစည်းများ

1. ဤအစီရင်ခံစာ အခန်း(၂) တွင်ဖော်ပြထားသော ပတ်ဂန်းကျင်နှင့် အခြား ဆက်စပ်ဥပဒေများကို အစိုးရဌာနဆိုင်ရာများအနေနှင့် လေ့လာသုံးသပ်ပြီး ဥပဒေစိုးမိုးရေး အတွက် တာဂန်ရှိသည့် အဖွဲ့အစည်းများ ဌာနများကို တာဂန်ပေးခြင်းများ ပြုလုပ်ရန်
2. ပတ်ဂန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု ကို နားလည်သဘောပေါက်ရန် ၊ ဥပဒေစိုးမိုးမှုများကို လေ့လာစောင့်ကြည့်ရန် နှင့် ပတ်ဂန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ကိစ္စများကို လေ့လာစောင့်ကြပ်ရေး နည်းလမ်းများကို တည်ဆောက်နိုင်ရန်အတွက် မြို့နယ်နှင့် ပြည်နယ်ဒေသ အတွင်း ပတ်ဂန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု ကော်မီတီဖွဲ့စည်းရန်
3. ဂေဟစနစ်မှ ပေးသော ဂန်ဆောင်မှုများနှင့် ဒဏ်ခံနိုင်စွမ်းဆက်စပ်ပုံများကို အခြေခံသော ပတ်ဂန်းကျင်ဆိုင်ရာ အသိပညာပေး လုပ်ငန်းများကို ဒေသခံလူထုအတွင်း ဆောင်ရွက်သွားရန်
4. အမှိုက်သိမ်းဆည်းနည်းများ၊ အမှိုက်ပစ်နည်းများ နှင့် ရေရှည်ဖွံ့ဖြိုးတိုးတက်မှုကို ဦးတည်သော အမှိုက်များစီမံခန့်ခွဲမှု များနှင့် ပတ်သတ်သော အသိပညာပေး လုပ်ငန်းများ ပါဂင်သည့် မြို့နယ်ဆိုင်ရာ အမှိုက်စီမံခန့်ခွဲမှု စီမံချက်များ တည်ဆောက်နိုင်ရန်၊ ထိုစီမံချက်သည် အမျိုးသား စွန့်ပစ်အမှိုက်ဆိုင်ရာ မဟာဗျူဟာနှင့်အညီ ရေးဆွဲရန်
5. ပတ်ဂန်းကျင်ထိန်းသိမ်းရေးဌာနနှင့် အခြားဆက်စပ်ဌာနများမှ ဂန်ထမ်းများကို ပတ်ဂန်းကျင်ဆိုင်ရာ ပြဋ္ဌာန်းချက်ဥပဒေများ လက်တွေ့အကောင်အထည်ဖော်ရေးဆိုင်ရာ အရည်အသွေးမြှင့်တင်မှုများ ပြုလုပ်ရန်
6. ဖွံ့ဖြိုးရေးလုပ်ငန်းများကြောင့် ပတ်ဂန်းကျင်နှင့် ဒေသခံလူထုတို့၏ ရာသီဥတုဆိုးဂါးမှု ဒဏ်ခံနိုင်စွမ်းကို မည်သို့မည်ပုံ သက်ရောက်မှုရှိနိုင်ကြောင်း ကုမ္ပဏီများ အဖွဲ့အစည်းများမှ ပွင့်လင်းစွာ တင်ပြနိုင်ရေးအတွက် တွန်းအားပေးရန်
7. ပြည်နယ်အတွင်းရှိ ပတ်ဂန်းကျင်ထိန်းသိမ်းရေးဌာနမှ ဂန်ထမ်းများကို စီးပွားရေးလုပ်ငန်းများ၏ ပတ်ဂန်းကျင်ဆိုင်ရာ အကောင်အထည်ဖော် ဆောင်ရွက်မှုများကို လေ့လာစောင့်ကြပ်မှုနှင့် ပတ်သတ်သော အရည်အသွေးဆိုင်ရာသင်တန်းများ ပို့ချပေးခြင်းများ ပြုလုပ်နိုင်ရန်
8. မြို့နယ်အတွင်းရှိ ဌာနဆိုင်ရာများအနေနှင့် ရာသီဥတုပြောင်းလဲမှုများ၊ ရာသီဥတုပြောင်းလဲမှုများကြောင့် ဖြစ်ပေါ်လာသော ဘေးနှင့်ဖိစီးမှုများ၊ လက်ရှိစီမံကိန်းများမှ နောင်တွင်ဖြစ်ပေါ်လာနိုင်သော ပတ်ဂန်းကျင်ဆိုးကျိုးသက်ရောက်မှုများကို ဖော်ထုတ်နိုင်ရန်အတွက် BRACED စီမံကိန်းမှ ပြုစုခဲ့သော ဗျူဟာမြောက်ပတ်ဂန်းကျင်ဆိုင်ရာ ဆန်းစစ်ခြင်းနှင့် ကျေးရွာလူထု`၏ ဘေးအန္တရာယ်ခံနိုင်စွမ်း စစ်တမ်းများကို လေ့လာသုံးသပ်ရန်
9. မြို့နယ်ဆိုင်ရာ ဘေးအန္တရာယ်စီမံချက်ရေးဆွဲရာတွင် ဤအစီရင်ခံစာပါ အချက်အလက်များ၊ အန္တရာယ်စစ်တမ်းများကို ကိုးကားနိုင်ရန် နှင့် အဆိုပါ စီမံချက်သည် ဤအစီရင်ခံစာ နှင့်အတူ အပြန်အလှန် ပေါင်းစည်းနိုင်ရန်
10. တောင်ကုတ်ချောင်း ရေအရည်အသွေး နမူနာများ ကောက်ယူခြင်းနှင့် တောင်ကုတ်မြို့ လေထုအရည်အသွေး ကောက်ယူခြင်းတို့ ပြုလုပ်ခြင်းဖြင့် ဒေသအတွက် အခြေခံ ပတ်ဂန်းကျင်ဆိုင်ရာ ရည်ညွှန်းချက် တခုအဖြစ် ပြုလုပ်သွားနိုင်ရန်

စီးပွားရေးလုပ်ငန်းများ

11. စီမံကိန်းအသစ်များနှင့်လုပ်ငန်း အသစ်များ၏ ကနဦးအဆင့်တွင် လူထုတွေ့ဆုံရေးနှင့် အကြံဉာဏ်တောင်းခံရေး လုပ်ငန်းစဉ်များ ပိုမိုဆောင်ရွက်လာနိုင်စေရန်
12. စီမံကိန်းနှင့် စီးပွားရေးလုပ်ငန်းများ၏ ပတ်ဝန်းကျင် ၊ကျန်းမာရေးနှင့် လုပ်ငန်းခွင်ဆိုင်ရာ ဘေးအန္တရာယ်ကင်းရှင်ရေး ဆိုင်ရာ စံနှုန်းများ၊ မူဝါဒများကို တရားဝင်ထုတ်ပြန်ခြင်းဖြင့် ပွင်းလင်းမြင်သာမှုများကို ဖော်ဆောင်ရန်
13. ရပ်ရွာလူထု ဝန်ဆောင်မှုလုပ်ငန်းများ နှင့်စနစ်များ(စိုက်ပျိုးရေးဝန်ဆောင်မှုများ၊ ရပ်ရွာ အခြေခံအဆောက်အဦများ၊စွမ်းအင်နှင့် ရေရရှိရေး ဝန်ဆောင်မှုများ စသည်ဖြင့်)၊ ရပ်ရွာလူထု၏ အစွန်းရောက်ရာသီဥတုများ၊ ပတ်ဝန်းကျင် ဆိုးကျိုးများအပေါ် ဒဏ်ခံနိုင်ရည်စွမ်းကို မည်သို့ သက်ရောက်နိုင်သည် ဆိုသော တွေ့ရှိချက်များကို ဖေမျှဖြန့်ဖြူးရန်၊ ဆိုးကျိုးများကို လျော့ပါးစေသော အစီအမံများ ဆောင်ရွက်ရန်
14. ဖွံ့ဖြိုးရေးစီမံကိန်းများနှင့် စီးပွားရေးလုပ်ငန်းများသည် စီးပွားရေး တိုးတက်မှုနှင့် အကျိုးအမြတ် ရနိုင်မှုကို ဦးတည်သော ဘေးဒဏ်ခံနိုင်စွမ်း ဆိုင်ရာ လုပ်ငန်းများ ပါဝင်သည့် စီးပွားရေး ဆောင်ရွက်မှုများ ပိုမိုများပြားလာစေရန် တွန်းအားပေးရန် (ဥပမာ- စိုက်ပျိုးရေးနှင့်သက်ဆိုင်သော လုပ်ငန်းများ၊ ရပ်ရွာလူထုအတွက် အခြေခံ အဆောက်အဦများ၊စွမ်းအင်နှင့် ရေ ဖြန့်ဖြူးရေး ဝန်ဆောင်မှ လုပ်ငန်းများ)
15. လုပ်ငန်းခွင်ဆိုင်ရာ ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးများနည်းတူ စီမံကိန်းအနီးတဝိုက်မှ ဒေသခံပြည်သူတို့၏ ကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေးအတွက်လည်း ဆောင်ရွက်ရန်
16. အခြား စီးပွားရေးဆိုင်ရာ လုပ်ငန်းများနှင့်အတူ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနှင့် ပတ်ဝန်းကျင်ညစ်ညမ်းမှုများ ကာကွယ်ရေး တို့သည်လည်း အရေးကြီးကြောင်း သတ်မှတ်ထားနိုင် ရန်
17. တည်ဆဲ EIA လုပ်ထုံးလုပ်နည်း နှင့်အညီ စီမံကိန်းနှင့်ဆိုင်သော ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံချက်များကို ရေးဆွဲအကောင်အထည်ဖော်ရန်
18. စီးပွားရေးနှင့် ဖွံ့ဖြိုးရေးလုပ်ငန်း များကြောင့် ပတ်ဝန်းကျင်ဆိုးကျိုးနှင့် ဒေသခံတို့၏ အစွန်းရောက်ရာသီဥတုဒဏ်ခံစွမ်းရည်များကို မထိခိုက်စေရန်အတွက် မိမိတို့၏ လုပ်သားထုများကို ပတ်ဝန်းကျင်ဆိုင်ရာ သင်တန်းများပေးရန်အတွက် အစီအစဉ်များ ရေးဆွဲရန်
19. စီးပွားရေးလုပ်ငန်းကြီးများအနေနှင့် ဒေသခံတို့၏ ရာသီဥတုဒဏ်ခံနိုင်စွမ်းရည် မြင့်တက်လာစေရန် ၊ ဂေဟစနစ်မှပေးသော ဝန်ဆောင်မှုများကို ထိန်းသိမ်းရန် နှင့် ပတ်ဝန်းကျင်ဆိုင်ရာစီမံချက်များ ပါဝင်သော လူမှုတာဝန်သိမှ အစီအစဉ်များရေးဆွဲ အကောင်အထည်ဖော်ရန်

အရပ်ဖက်အဖွဲ့အစည်းနှင့်ဒေသခံလူထု

20. သက်ဆိုင်ဆက်စပ်သူများ အစည်းအဝေးများတွင် ပါဝင်ဆွေးနွေးရန်
21. မိမိတို့အစဉ်အဆက်တွေ့ကြုံခဲ့ရသော အဖြစ်အပျက်များ ဗဟုသုတများကို ထိုသို့သော ဆွေးနွေးပွဲများတွင် အတွေ့အကြုံဖလှယ်ခြင်း၊ စိတ်ပူပန်သောအကြောင်းများနှင့် ဖြစ်ပေါ်နိုင်သော စိန်ခေါ်မှုများကို တင်ပြရန်
22. အစိုးရနှင့်အခြားအဖွဲ့အစည်းများမှ ဦးဆောင်ကျင်းပသော အပြုသဘောဆောင်သည့် ပတ်ဝန်းကျင် ဆိုင်ရာ ထိန်းသိမ်းရေး ပညာပေးရေး လုပ်ရှားမှုများတွင်တက်ကြွစွာပါဝင်ရန်
23. စီမံကိန်းအသစ်လုပ်ငန်းအသစ်များ ပတ်ဝန်းကျင်ဆိုင်ရာဥပဒေများနှင့် အညီ လုပ်ငန်းလည်ပတ်မှ ရှိမရှိ စောင့်ကြည့်ရေး ယန္တယားတခု ဖွဲ့စည်းသွားရန်
24. စီးပွားရေးနှင့် အခြားဖွံ့ဖြိုးတိုးတက်ရေး လုပ်ငန်းများ၏ တာဝန်ယူမှုနှင့် တာဝန်ခံမှုများ တိုးတက်လာစေရန် လုပ်ငန်းများ၏ ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံဆောင်ရွက်မှုများကို လေ့လာစောင့်ကြည့်ရန်

အခြေခံဇယား

စဉ်	လုပ်ငန်း (သို့) စီမံကိန်းပုံစံ	အကြံပြုချက်	ရာသီဥတုပြောင်းလဲမှု ဖြေလျော့ခြင်း၊ လိုက်လျောညီထွေဆောင်ရွက်ခြင်း နှင့် ခံနိုင်ရည်ရှိခြင်း ဆိုင်ရာ အကျိုးကျေးဇူးများ
၁. ငါးပုဇွန်ကန်များမွေးမြူခြင်း			
၁(က)	အထွေထွေ	• မိရိုးဖလာ နည်းစနစ်မှာ ပိုမိုတိုးတက်သော နည်းစနစ်များ အသုံးပြု ဆောင်ရွက်ခြင်း • ဒီဇရောက်သစ်တောများကို ထိခိုက်ခြင်းမှ ရှောင်ကျဉ်ခြင်း • ပျက်စီးသွားသော ဒီဇရောက်သစ်တောများ ပြန်လည်ထူထောင်ရေး လုပ်ငန်းများကို နည်းလမ်းအသစ်များဖြင့် ဆောက်ရွက်ခြင်း	• ဒီဇရောက်သစ်တောများထိန်းသိမ်းခြင်းနှင့် ဂေဟစနစ်မှ ထောက်ပံ့သော အစားအစာလုံခြုံရေး ပိုမိုအားကောင်းခြင်း
၂. စွန့်ပစ်အမှိုက်များစီမံခန့်ခွဲမှု			
၂(က)	အထွေထွေ	• မြို့နှင့်ကျေးရွာများအလိုက် စွန့်ပစ်အမှိုက်များစီမံချက်များကို ပြန်လည် သုံးသပ်ရင်း ပိုမိုကောင်းမွန်သော စီမံချက်များ ရေးဆွဲ အကောင်အထည် ဖော် သင့်ပါသည်။ ထိုသို့ရေးဆွဲရာတွင် ကျွမ်းကျင် ပညာရှင်များ၏ ပံ့ပိုးမှု ဖြင့် မြို့နယ်စည်ပင်သာယာမှ ဦးဆောင်ကာ ပြည်သူများ နှင့်ညှိနှိုင်းပြီး ဆောင်ရွက်သင့်ပါသည်။ • ရှေ့ရှည်တည်တံ့မှု ဖွံ့ဖြိုးမှုတို့ကို ဦးတည်သော ရည်ရွယ်ချက်ဖြင့် ပြည်သူ တို့၏ အမှိုက်သိမ်းဆည်း၊စွန့်ပစ်နေမှုများနှင့်ပတ်သတ်၍ အသိပညာ မြင့်မားရေး လုံးဆောမှုများ ပြုလုပ်သင့်ခြင်း၊ • ထိရောက်သော စီမံခန့်ခွဲမှု နှင့် စောင့်ကြည့် စစ်ဆေးမှုရှိစေရန် ထားရှိ နိုင်ခြင်း များမှ တစ်ဆင့် ဒေသပြည်သူတို့အတွက် ရောဂါဘယများ လျော့နည်းအောင် အထောက်အကူအဖြစ် စေနိုင်ပါသည်။ • အမှိုက်များကို စွန့်ပစ်ဖျက်သိမ်းရန်အတွက် သင့်တော်သောနေရာများကို ရွေးချယ်ထားသင့်ပါသည်။ ထိုသို့ရွေးချယ်ရာတွင် ပတ်ဂန်းကျင် ထိခိုက် နိုင်သော နေရာများ လူနေအိမ်ခြေနှင့်နီးသော နေရာများကို ရှောင်ရှားရန်	• စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု ဆိုင်ရာ အဆောက်အဦများတိုးတက်စေခြင်း • ပတ်ဝန်းကျင်ဆိုင်ရာ အာရုံစိုက်မှုအား တိုးတက်စေခြင်း။ • စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု အလေ့အကျင့်အား တိုးတက်စေခြင်း • မြေဆွေးပြုလုပ်သော လုပ်ငန်းများ Composition plants များမှ သဘာဝ (အော်ဂဲနစ်) မြေဩဇာကောင်းသော ကြွင်းကျန်ပစ္စည်းကို အသုံးချခြင်းအား တိုးတက်စေခြင်း။ • ကျန်းမာရေးထိခိုက်မှု လျော့ချခြင်း။ • စွန့်ပစ်ပစ္စည်းဆိုင်ရာ ကိစ္စရပ်များကို ကိုင်တွယ်ရာတွင် လူထုပူးပေါင်းပါဝင်မှုအား ပိုမိုအားကောင်းလာစေခြင်း။

စဉ်	လုပ်ငန်း (သို့) စီမံကိန်းပုံစံ	အကြံပြုချက်	ရာသီဥတုပြောင်းလဲမှု ဖြေလျော့ခြင်း၊ လိုက်လျောညီထွေဆောင်ရွက်ခြင်း နှင့် ခံနိုင်ရည်ရှိခြင်း ဆိုင်ရာ အကျိုးကျေးဇူးများ
၂(ခ)	ဂေဟစနစ်ပတ်ဝန်းကျင်	• နိုင်ငံတကာ အဖွဲ့အစည်းများ၏နည်းပညာ နှင့် အခြားအကူအညီများဖြင့် မြေဆွေးပြုလုပ်သော စီမံကိန်းများ လုပ်ဆောင်ရန်	• ရေထုနှင့်လေထုအရည်အသွေးထိန်းသိမ်းခြင်းမြေဆွေးများမှတဆင့်သဘာဝဓါတ်မြေဩဇာအသုံးပြုမှု မြင့်တက်လာနိုင်ခြင်း • အခြေခံအဆောက်အဦးများရှိမှုကို ပိုမိုများပြားလာစေခြင်း
၂(ဂ)	မြေယာရှုခင်းသဘာဝအလှအပ	• သဘာဝမြေဆွေးထုတ်လုပ်သည့်စီမံကိန်းများ ဖြစ်နိုင်ခြေ ရှိမရှိ လေ့လာခြင်း၊ တည်ဆောက်ခြင်းတို့ဖြင့် မြေနေရာကို လျော့ချနိုင်ခြင်း	• မြေအသုံးချမှုနည်းပါးခြင်းနှင့် သဘာဝမြေယာရှုခင်းများ မပျက်စီးခြင်း
၂(ဃ)	လေထုအရည်အသွေး	• အမှိုက်ကိုတိုက်ရိုက် မီးရှို့သည့်စနစ်ကို အတတ်နိုင်ဆုံးလျော့ချခြင်း နှင့် နောက်ဆုံး အပြီးအပိုင်ရပ်စဲခြင်း	• လေထုညစ်ညမ်းမှုကို လျော့ချနိုင်ခြင်း
၂(င)	ရေထုအရည်အသွေး နှင့်မြစ်ဂေဟစနစ်	• တောင်ကုတ်ချောင်းမအတွင်းသို့ မည်သည့်အမှိုက်အမျိုးအစားမဆို စွန့်ပစ်ခြင်းကို ထိရောက်စွာ တားဆီးရန် • ချောင်းအတွင်းသို့ အမှိုက်များစွန့်ပစ်ခြင်းကို ကာကွယ်ရန် ကမ်းနားမတလျောက်တွင် အမှိုက်ပုံများ လုံလောက်စွာ ထားရှိရန်	• မြစ်ရေ အရည်အသွေး ပိုမိုကောင်း မွန်လာပြီး၊ မြစ်အတွင်းရှိ ရေနေသတ္တဝါများ အပေါ် သက်ရောက်မှု လျော့ကျ လာမည် • ဒေသခံ လူထု၏ အစားအစာ ရရှိနိုင်မှု တိုးမြင့်လာမည်
၂(စ)	လူထုကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေး	• မြေမြုပ်အမှိုက်စွန့်ပစ်သည့်နေရာများကို လူနေအိမ်ခြေများမှ သင့်တော်သော အကွာအဝေးတွင် ထားရှိခြင်း • လူထုပညာပေးလုပ်ရှားမှုများမှတဆင့် အများပြည်သူပိုင်နေရာများတွင် အမှိုက်ပစ်မှုများ နည်းပါးသွားအောင်လုပ်ခြင်း	• လူများနေထိုင်ရာ နေရာ နှင့် စွန့်ပစ်ပစ္စည်း စွန့်ပစ်ရာနေရာများ ထိတွေ့မှုကို လျော့ချပြီး လူထု၏ ကျန်းမာရေး နှင့် ဘေးကင်းလုံခြုံမှုကို သေချာစေခြင်း
• ၃.ရွှေပြောင်းတောင်ယာစနစ်များ ၊လယ်ယာမြေများချေထွင်ခြင်း၊ တောပြုန်းခြင်း			
၃(က)	အထွေထွေ	• ဒေသခံတို့၏ ပူးပေါင်းပါဝင်မှုဖြင့် သစ်တောနှင့် အခြားဆက်စပ် တည်ဆဲဥပဒေများကို လိုက်နာခြင်းနှင့် စိုးမိုးမှုရှိစေရန် ဆောင်ရွက်ခြင်း • စောင့်ကြပ်စစ်ဆေးမှုများကို စနစ်တကျပြုလုပ်ခြင်း	• သစ်တောများပြုန်းတီးခြင်းကို ကာကွယ်ခြင်းဖြင့်ဂေဟစနစ်စွမ်းဆောင်ရည်များ တိုးတက်လာကာ ဒေသခံတို့၏ ဒဏ်ခံနိုင်စွမ်းများမြင့်မားလာခြင်း

စဉ်	လုပ်ငန်း (သို့) စီမံကိန်းပုံစံ	အကြံပြုချက်	ရာသီဥတုပြောင်းလဲမှု ဖြေလျော့ခြင်း၊ လိုက်လျောညီထွေဆောင်ရွက်ခြင်း နှင့် ခံနိုင်ရည်ရှိခြင်း ဆိုင်ရာ အကျိုးကျေးဇူးများ
၃(ခ)	ဂေဟစနစ်ပတ်ဝန်းကျင်	• ဥပဒေစိုးမိုးရေး၊ အသိပညာမြင့်တင်ရေး လုပ်ရှားမှုနှင့် စွမ်းရည် တိုးတက်ရေး ဆောက်ရွက်ချက်များမှတဆင့် ဒေသခံတို့ အသိစိတ်ဓါတ်များ မြင့်တက်လာစေကာ ရွေ့ပြောင်း တောင်ယာစနစ်များ နည်းပါးလာစေရန် ဆောင်ရွက်ခြင်း	• အဖွဲ့အစည်းဆိုင်ရာ ပူးပေါင်း ဆောင်ရွက်မှုကို အားကောင်း စေခြင်း
၃(ဂ)	လေထုအရည်အသွေး	• ခုတ်လှဲပြီးသော သစ်ပင်များ၏ အကြွင်းအကျန်များနှင့် မကြီးထွားသေးသော အပင်များကို မီးရှို့ခြင်းကို တားဆီးသင့်သည်	• လေထုညစ်ညမ်းစေသော အရာများ ထုတ်လွှတ်မှုကို လျော့ချနိုင်ခြင်း • ဥပဒေကိုလိုက်နာခြင်း
၃(ဃ)	သက်မွေးဝမ်းကြောင်း	• သမာရိုးကျလယ်ယာစိုက်ပျိုးမှုစနစ်မှ စက်မှုနည်းပညာကိုအသုံးပြုပြီး မြေအနည်းငယ်ဖြင့် အထွက်တိုးနိုင်စွမ်းရှိသော နည်းစနစ်များကို ပညာရှင်များ အကူအညီဖြင့် ဆောင်ရွက်သင့်သည် • ပိုမိုထိရောက်သော ရေရှည်ဖွံ့ဖြိုးတိုးတက်မှုကို ဦးတည်သော ရာသီဥတု ဖောက်ပြန်မှုများကို ခံနိုင်သော၊ ဓါတုဆေးဝါး အနည်းငယ်သာ အသုံးပြုသော စိုက်ပျိုးရေး စနစ်များကို တွန်းအား ပေးသင့်ပါသည်	• အစားအစာအတွက် မပူပန်ရခြင်း • ရေရှည်တည်တံ့ဖွံ့ဖြိုးတိုးတက်သော လူနေမှုဘဝ • စိုက်ပျိုးရေးစနစ်များ တိုးတက်လာခြင်း • မြေယာသိမ်းဆည်းမှုပြဿနာများ နည်းပါးခြင်း
၄. မီးသွေးဖုတ်ခြင်းနှင့် မီးဖိုထင်းခုတ်ခြင်း			
၄(က)	အထွေထွေ	• လက်ရှိတည်ဆဲဥပဒေစိုးမိုးခြင်း • လောင်စာသက်သာစေသော ထင်းမီးဖိုများအား အစားထိုးသုံးစွဲနိုင်မှု မြှင့်တင်နိုင်ရေး • ပြန်လည်ပြည့်ဖြိုးမြဲစွမ်းအင် အရင်းအမြစ်များ ဦးစားပေး ရှာဖွေခြင်း ဖော်ထုတ်ခြင်း လည်ပတ်ခြင်း	• လူတို့ကျန်းမာရေးတိုးတက်ခြင်းနှင့် ဇီဝမျိုးကွဲများဆုံးရှုံးမှု လျော့နည်းခြင်း
၅.မြို့ရွာများ ချဲ့ထွင်ခြင်း			
၅(က)	အထွေထွေ	• စနစ်ကျသော အစီအစဉ်များဖြင့် အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်း စတင်မပြုလုပ်မီ အခြေခံအဆောက်အဦများဖြစ်သော လမ်းများ၊ ရေနုတ်မြောင်းများ၊အမှိုက်ပစ်စနစ်များ၊လျှပ်စစ်ဓါတ်အားပေးရေး၊ နှင့်အခြားအဆောက်အဦများ စနစ်တကျဦးစားပေးလုပ်ဆောင်ခြင်း	• သစ်တောနှင့် သဘာဝပေါက်ပင်များ ပျက်စီးမှုနည်းပါးခြင်း • ပြည်သူ့ကျန်းမာရေး ပိုမိုတိုးတက်ခြင်း

စဉ်	လုပ်ငန်း (သို့) စီမံကိန်းပုံစံ	အကြံပြုချက်	ရာသီဥတုပြောင်းလဲမှု ဖြေလျော့ခြင်း၊ လိုက်လျောညီထွေဆောင်ရွက်ခြင်း နှင့် ခံနိုင်ရည်ရှိခြင်း ဆိုင်ရာ အကျိုးကျေးဇူးများ
		• ထိုသို့တည်ဆောက်ရာတွင် ပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားကို ထိခိုက်နိုင်သော နေရာများမှ ရှောင်ကြဉ်ခြင်း	
၆. လမ်းများချဲ့ထွင်ခြင်း			
၆(က)	အထွေထွေ	• ပတ်ဝန်းကျင်မထိခိုက်စေရန်နှင့် လူမှုရေးဘဝများ မနစ်နာစေရန် အတတ်နိုင်ဆုံး ရှောင်ရှားကာ ဖြစ်နိုင်ခြေနေရာများကို တွက်ချက် ဖောက်လုပ်ခြင်း • တည်ဆဲပတ်ဝန်းကျင်ဆိုင်ရာဥပဒေများနှင့်အခြားလူမှုစီးပွားဆိုင်ရာ လုပ်ထုံးလုပ်နည်းများကို လိုက်နာခြင်း	• သစ်တောနှင့် သဘာဝပေါက်ပင်များ ပျက်စီးမှု နည်းပါးခြင်း
၇.ရာသီဥတုပြောင်းလဲမှုနှင့် ဂေဟစနစ်စီမံခန့်ခွဲမှု			
၇(က)	အထွေထွေ	• ဂေဟစနစ်မှ ပေးသော ဝန်ဆောင်မှုများ ၏ အရေးပါပုံ၊ ၄င်းတို့ နှင့် ဒေသခံပြည်သူတို့၏ ဘေးဒဏ်ခံနိုင်စွမ်း ၊ရာသီဥတုပြောင်းလဲမှုများ ဆက်စပ်ပုံ များအကြောင်းကို အသိပညာပေးလှုပ်ရှားမှုများ ပြုလုပ်ကာ ဒေသခံပြည်သူများနားလည် သဘောပေါက်အောင် ဆောင်ရွက်သင့်ပါသည် • လက်ရှိစီမံကိန်းများ၊ စီမံချက်များ ၊ဝန်ဆောင်မှုလုပ်ငန်း များကြောင့် အနာဂါတ်တွင်ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ နှင့် ဒေသခံပြည်သူတို့အပေါ်တွင် သက်ရောက်နေသော ရာသီဥတု ဘေးဒဏ်နှင့် ဖိစီးမှုများကို ခွဲခြားဖော်ထုတ်နိုင်ရန် BRACED စီမံကိန်းမှ ပြုစုသော Community Resilience Assessment (ရပ်ရွာလူထု ဘေးဒဏ်ခံနိုင်စွမ်း စစ်တမ်း)များကို ဖတ်ရှုကာ သုံးသပ်သင့်ပါသည် • ဒေသခံလူထုနှင့်အစိုးရ တို့ပေါင်းစပ်ပြီး ပတ်ဝန်းကျင်နှင့်ဂေဟစနစ် ဝန်ဆောင်မှုများ တိုးတက်လာရေး၊ ကာကွယ်ထိန်းသိမ်းရေးများကို အတူတကွ လုပ်ဆောင်သင့်ပါသည်။ အသေးစား ရံပုံငွေများ ထောက်ပံ့ပေးခြင်းအားဖြင့် သဘာဝဇီဝမျိုးစုံမျိုးကွဲ၏ ဂေဟစနစ်ဝန်ဆောင်မှု တိုးတက်လာခြင်းနှင့်အတူ အင်အားအနည်းပါးဆုံး	• ဂေဟစနစ် ဝန်ဆောင်မှုများ ကောင်းလာခြင်း • ဒေသခံပြည်သူတို့၏ ဒဏ်ခံနိုင်စွမ်းအားများ မြင့်တက်လာခြင်း

စဉ်	လုပ်ငန်း (သို့) စီမံကိန်းပုံစံ	အကြံပြုချက်	ရာသီဥတုပြောင်းလဲမှု ဖြေလျှော့ခြင်း၊ လိုက်လျောညီထွေဆောင်ရွက်ခြင်း နှင့် ခံနိုင်ရည်ရှိခြင်း ဆိုင်ရာ အကျိုးကျေးဇူးများ
		အစုအဖွဲ့ပင်ဒေသခံပြည်သူများ၏ ဘေးဒဏ်ခံနိုင်စွမ်းအားများ တိုးတက်လာနိုင်မည်ဖြစ်ပါသည်	

Reference

1. Climate Profile (Climate Variabilities, Extremes and Trends in Central Dry, Coastal and Hilly Zones) Myanmar by RIMES
2. Community Risk Assessments , Taungup Township, Plan Myanmar
3. Effect of Slash and Burn and Deforestation in Climate Change, Jhon, S.I .Ingram, University of Oxford
4. EIA Guideline for Oil Palm Development, State of Environmental Conservation Department, Sabah, Malaysia
5. ESIA Guideline April 2015, Cement Sustainability Initiative (CSI) , World Business Council For Sustainable Development
6. Guideline for Design and Operation of Municipal Solid Waste Landfill in Tropical Climate
7. Guidance Notes on Land Acquisition in Myanmar, UNHABIT-UNHCR ,2010
8. Guidance on Integrating Climate Change and Biodiversity to Environmental Impact Assessment, European Commission
9. Health effect of burning municipal solid waste, Saskatchewan Ministry of Environment, www.environment.sk.ca
10. Municipal Solid Waste Selection, Genermo Beris and Yohanis Birhanu, International Science and Research Publication , V5, Issue 4 April 2015
11. Myanmar Polulation and Housing Census, 2014, Union Report
12. Renewable Energy Expert , Environmental Issue, Saman Zafar,
13. Open burning, UK Cooperative Extension Service University of Kentucky , College of Agriculture
14. Open Burning Of Residential Trash, Environmental Fact Sheet, Newhampshire Department Of Environmental Service (www.des.nh.gov)
15. Pilot Strategic Envrionmental Assessment for Development Plans in the Kangan Area, Islamic Republic of Iran, UNDP, 25 June 2007.
16. Soiled Waste Disposal, - A Burning Problem To Be Resolved To Save Environment (https://saferenvironment.wordpress.com)
17. Sustainable Solution for Municipal Solid Waste Management in Thailand, Thaniya, Kaosol , International Journal V 3 No 12, 2009, World Academy of Science
18. The Effect of Slash Burning On Ecosystem Nutrient During Land Preparation Phase of The Shifting Cultivation, Christian P. Giardia, Robert. L. Sanford and Others

Appendix

Appendix A.*River and Ecosystem Service*

Name	Flow		Mile	Place	Wide	Used
	From	To				
Taunggup stream	East	West	55	Thane Taung	150 feet	drinking water
Ma Eee stream	East	West	45	Ma Eee	100 feet	drinking water
La Muu stream	East	West	58	La Muu	100 feet	drinking water
Sar Pyin	East	West	39	Sar Pyin	100 feet	drinking water
Tan Hlwe	East	West	51	Tan Hlwe	100 feet	drinking water

AppendixB. *Stakeholder Meeting*