MAWLAMYINE

TOWNSHIP ENVIRONMENTAL ASSESSMENT

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MYANMAR ENVIRONMENT INSTITUTE

BRACED Building Resilience and Adaptation to Climate Extremes and Disasters

MEI

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

Abbreviation and Acronyms

BRACED	Building Resilience and Adaptation to Climate Extremes and Disasters
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CRA	Community Risk Assessment
CSO	Civil Society Organization
CSR	Corporate Social Responsibility
ECD	Environmental Conservation Department
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EU	European Union
GHG	Green House Gas
IEE	Initial Environmental Examination
IFC	International Finance Corporation
Inh/km2	Inhabitant per Kilometer Square
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
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
TPD	Ton per Day
WCS	Wildlife Conservation Society

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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 townships 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 Mawlamyine Township by giving a contextual overview of the situation in the township.

Environmental Scoping

The preliminary scoping study was conducted through stakeholder consultation meetings in Mawlamyine Township and through 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.

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

Development and Activities	Key Environmental Issues
Expansion of human settlement and pressure on mangrove community	Mangrove, Terrestrial Ecology
Waste management	Air pollution , water pollution, health hazard
Instream sand mining	River ecology and hydrology
Mawlamyine industrial zone	Livelihood, pollution, health and safety
Tourism	Cultural heritage , livelihood

Environmental Baseline

Tropical evergreen forest and monsoon deciduous forests can be found in Mawlamyine Township because of heavy torrential rainfall. Long time ago, there were a lot of forests covered in Zaygyo quarter, Taungwine quarter and Taung paw tan quarter which are situated in the east and south of Mawlamyine township. But now, a lot of forests are destructed due to many purposes such as construction, agriculture, land use conflict and many other factors. Only few big trees have been reserved in the Taungwaing Hill. Pyinkado, Padauk and Teak trees are found in some parts of Mawlamyine Township.

Thanlwin River Mouth is subjected to be one of the scientific interests for its unique hydrological characteristics. It is the center point of the mouth of Thanlwin, Attaran, and Gyaing which is near the Mawlamyine, capital city of Mon State.

Socio economic, Culture, Religion and Ethnicity

Mawlamyine is rich with places which draw many attentions of both tourist and domestic travellers as it is filled with many interesting hotspots to visit and enjoy. Thanlwin River and other rivers, Stupa capped hill, colonial era- buildings and other landscapes are the major tourist destinations.

In 2006, the total population of Mawlamyine was 238,388 persons[1]. Total population of Mawlamyine Township in 2014 was 289,388 with population density of 2, 082.1 inh./km. Being an administrative and trading hub of the region, the majority of populations resides the urban area.

In 2014, 253,743 (88%) out of the total population of lived in the urban area while the remaining 35,643 persons (12%) resided in the rural area.

Mawlamyine is famous for its tropical fruits. The main plantation is paddy and rubber. Rubber is widely grown in the region as important perennial plantation for industrial use. In addition, orchard crops such as durian, rambutan, mangosteen and pomelo, pineapple, citrus fruits and avocado are grown for economy.

Environmental Impact Analysis, Environmental Threats and Vulnerability in Mawlamyine

Both rural and urban communities of Mawlamyine Township experience wide ranges of natural disasters including seasonal floods. These natural disasters are exacerbated by environmental impacts driven by development projects, business practices and other human activities,

Some adverse environmental impacts triggered by development and human activities are identified in scoping phase. Environmental degradation from mangrove disruption, water pollution and public concerns are considered to significant impact on vulnerability of communities of the regions.

Recommendation and Generic Environment

This study provides recommendations for measures that should be integrated into existing or future township policy, plan, programs and regional development plans to improve environmental and social protection of existing activities.

Recommendations are targeted at business, government, community and CSOs.

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

[1] Y.M.Pike & W.Win /GMSARN International Journal 10(2016) 187-196

[2] Need assessment for effective implementation of the environmental conservation law in Myanmar

3. Promote community environmental awareness campaign highlighting the importance of ecosystem services and its relation to community resilience
4. Mawlamyine 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. The waste management plan should be prepared 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. Improve capacity of staff for inspection and monitoring of environmental performance of business activities which are likely to impact on environment and community resilience
7. 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
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 Mawlamyine. 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

Industry and Business

9. Improvement public participation and consultation in project development phase of new projects and activities
10. Initiate transparency and openness about project and business operations with publication of environmental, health and safety standards and policies
11. 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
12. 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.)
13. Prioritize environmental conservation and pollution prevention mechanisms in business operations
14. Develop project specific environmental management framework with local government departments and implementation in accordance with existing EIA guidance and laws
15. 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

16. Initiate Corporate Social Responsibility programs focusing on enhancement of community resilience, protection of ecosystem service and environmental management
17. To establish an environmental management committee of industrial park with aiming at the improvement in environmental management of entire industrial area. Necessary environmental trainings should be given to them.

Community and Civil Society

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

အကျဉ်းချုပ် အစီရင်ခံချက်

မြန်မာ့ပတ်ဝန်းကျင်သိပ္ပံသည် အစွန်းရောက် ရာသီဥတုများ၏ ဘေးဒဏ်ခံနိုင်စွမ်း တည်ဆောက်ခြင်း နှင့် လိုက်လျောညီထွေ စွာနေထိုင်ခြင်း (BRACED) စီမံကိန်း၏ အစိတ်အပိုင်းတစ်ရပ်အဖြစ် မြန်မာနိုင်ငံအတွင်း ရွေးချယ်ထားသော မြို့နယ်(၈)မြို့နယ်တွင် ပတ်ဝန်းကျင်ဆိုင်ရာ ဆန်းစစ်ခြင်း ပြုလုပ်ရန် တာဝန်ယူခဲ့ပါသည်။ BRACED စီမံကိန်းသည် ရွေးချယ်ထားသော မြို့နယ်ရှစ်မြို့နယ်အတွင်း လူဦးရေ သုံးသိန်းငါးသောင်းကျော် တို့တွင် အစွန်းရောက် ရာသီဥတုများကြောင့်ဖြစ်ပေါ်သော သဘာဝဘေးဒဏ် 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 ဆိုးကျိုးသက်ရောက်မှုများကို 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 ပတ်ဂန်းကျင်ဆိုင်ရာ အခြေခံ လမ်းညွှန်ချက်တစ်ရပ် ဖြစ်လာစေရန် ရည်မှန်းထားပါသည်။

ပတ်ဂန်းကျင်ဆိုင်ရာ ဥပဒေ မူဘောင်

၂၀၁၅ ခုနှစ်တွင် ပြဋ္ဌာန်းထားသော ပတ်ဂန်းကျင်ဆန်းစစ်ခြင်း လုပ်ထုံးလုပ်နည်း အခန်း (၁၂) အပိုဒ် (၁၀) တွင် ဗျူဟာမြောက် ပတ်ဂန်းကျင်ဆိုင်ရာ လေ့လာဆန်းစစ်ခြင်းနှင့် ပတ်သတ်၍ ထည့်သွင်းဖော်ပြထားပါသည်။ သယံဇာတနှင့်ပတ်ဂန်းကျင်ဆိုင်ရာ ဂန်ကြီးဌာနသည် လိုအပ်ပါက အခြားဂန်ကြီးဌာနများ၊ ပြည်နယ်နှင့်တိုင်း ဒေသကြီးများ ၊ခရိုင်နှင့်မြို့နယ်များ၊ ကိုယ်ပိုင်အုပ်ချုပ်ခွင့်ရ တိုင်းဒေသများနှင့် အခြား ပုဂ္ဂလိက အဖွဲ့အစည်းများမှ ရေးဆွဲသော မူဂါဒများ၊ဗျူဟာများ၊ဖွံ့ဖြိုးရေးစီမံချက်များ အတွက် ဗျူဟာမြောက်ပတ်ဂန်းကျင်ဆိုင်ရာ အစီရင်ခံစာပြုစုရန် သက်ဆိုင်ရာ တာဂန်ရှိသူများကို တောင်းဆိုမည်ဖြစ်ပါသည်။

အကယ်၍ ထိုမူဂါဒများ၊ဗျူဟာများ၊ဖွံ့ဖြိုးရေးစီမံကိန်းနှင့်မူဘောင်များ၊စီမံချက်များမှ ပတ်ဂန်းကျင်ဆိုင်ရာ ထိခိုက်မှုများ ရှိနိုင်သည်ဟု ယူဆပါက သက်ရောက်မှုများကို ဖော်ထုတ်နိုင်ရန်၊သင့်တော်သော လေ့လာဆန်းစစ်မှုများ ပြုလုပ်နိုင်ရန်၊ မဟာဗျူဟာမြောက် ပတ်ဂန်းကျင်အစီရင်ခံစာတွင် လေ့လာစောင့်ကြည့်ရေး မူဘောင်များ ထည့်သွင်းရေးဆွဲရန် တောင်းဆိုနိုင်ကြောင်း ဖော်ပြထားပါသည်။

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

ထို့ကြောင့်တည်ဆဲဥပဒေများအရ မဟာဗျူဟာမြောက် ပတ်ဂန်းကျင်ဆိုင်ရာ ဆန်းစစ်ခြင်း အစီရင်ခံစာ ပြုလုပ်ရန် ဥပဒေအရ လိုအပ်ချက်များ နည်းပါးနေကြောင်း တွေ့ရှိရပါသည်။

ယခုအစီရင်ခံစာသည် လက်ရှိ ပတ်ဂန်းကျင် သက်ရောက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း မှ ဖော်ပြထားသော အစိုးရ၏ စီးပွားရေးဖွံ့ဖြိုးတိုးတက်မှု စီမံချက်များ မူဂါဒများအတွက် ဗျူဟာမြောက်ပတ်ဂန်းကျင်ဆိုင်ရာ ဆန်းစစ်ခြင်း လိုအပ်ချက်ကို ဖြည့်ဆည်းရန်သို့မဟုတ် အစားထိုးရန် ရည်ရွယ်ခြင်းမဟုတ်ပါ။ ဒေသ အခြေအနေနှင့် ပတ်သတ်၍ ဖော်ပြထားသော အချက်အလက်များကို နောင်တွင် ပြုလုပ်မည့် ပတ်ဂန်းကျင်ဆိုင်ရာ လေ့လာမှုများအတွက် အသုံးပြုနိုင်ရန် သို့မဟုတ် အထောက်အကူပြုရန်သာ ရည်ရွယ်ပါသည်။

နယ်ပယ်အတိုင်းအတာ သတ်မှတ်ခြင်း

ကနဦးနယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်းလုပ်ငန်းကို မော်လမြိုင်မြို့နယ် အတွင်း သက်ဆိုင်သူများနှင့် ဆွေးနွေး အကြံဉာဏ်ရယူခြင်း ပြုလုပ်စဉ်က ထည့်သွင်းခဲ့သလို ရှိရင်းစွဲအချက်အလက်များကို ပြန်လည်သုံးသပ်စဉ်ကလည်း စဉ်းစားခဲ့ပါသည်။ ရှိရင်းစွဲနှင့်အနာဂါတ်တွင် ဖြစ်ပေါ်လာနိုင်သော လုပ်ငန်းများနှင့် ၎င်းတို့ကြောင့် ဖြစ်ပေါ်လာနိုင်သော ပတ်ဂန်းကျင်ဆိုးကျိုးသက်ရောက်မှုများကိုအောက်ပါဇယားတွင် ဆက်စပ်ဖော်ပြထားပါသည်။

စီမံကိန်းစီမံချက်များနှင့်ဆောင်ရွက်ချက်များ	အဓိကထားရမည့် ပတ်ဂန်းကျင်ဆိုင်ရာ ပြဿနာများ
လူနေအိမ် တိုးချဲ့ခြင်း နှင့် ဒီဇရောက်တောများအပေါ် သက်ရောက်မှု	ဒီဇရောက်တောများနှင့် ကုန်းတွင်းသစ်တောများ၊ ဂေဟစနစ်
အမှိုက်စွန့်ပစ်ခြင်း	လေထုရေထုညစ်ညမ်းမှု ကျန်းမာရေးပြဿနာ

မြစ်အတွင်းသဲတူးခြင်း	မြစ်ကြောင်းဆိုင်ရာ ဂေဟစနစ်နှင့် ဇလဗေဒ
မော်လမြိုင်စက်မှုဇုံ	သက်မွေးဝမ်းကျောင်းမှုများ၊ ရေထုညစ်ညမ်းမှု၊ကျန်းမာရေးနှင့် ဘေးကင်းရှင်းရေး
ခရီးသွားလုပ်ငန်း	ယဉ်ကျေးမှု အမွေအနှစ်များ သက်မွေးဝမ်းကြောင်း

ပတ်ဝန်းကျင်ဆိုင်ရာ အခြေခံအချက်အလက်များ

မိုးရေချိန် လုံလောက်ရွာ ရရှိခြင်းကြောင့် မော်လမြိုင်ဒေသတွင် အပူပိုင်းအမြဲစိမ်းသစ်တောနှင့် မုတ်သုန်ရွက်ပြတ်တောများ ပေါက်ရောက်ကြောင်းတွေ့ရှိရပါသည်။ မြို့၏အရှေ့ဖက်နှင့် တောင်ဖက်တွင် တည်ရှိသော ဧရိယာ။ တောင်ပိုင်းရပ်ကွက်နှင့်တောင်ပေါ်ပိုင်း ရပ်ကွက်များတွင် ရှေးယခင်က သစ်ပင်များ ထူထပ်စွာပေါက်ရောက်ခဲ့ပါသည်။ သို့သော်လည်း ဆောက်လုပ်ရေးလုပ်ငန်းများ၊စိုက်ပျိုးရေးလုပ်ငန်းများ၊ မြေယာအသုံးချမှု နှင့် အခြား အကြောင်းအရာများကြောင့် သစ်ပင်သစ်တော ထူထပ်မှုများ နည်းပါးသွားခဲ့ရပါသည်။ ယခုအချိန်တွင် သစ်ပင်ကြီးတချို့ကိုသာ တောင်ပိုင်းတောင်ကုန်းတွင် တွေ့မြင်ရ ပါတော့သည်။ ပျဉ်းကတိုး၊ပိတောက်နှင့် ကျွန်း ပင်များကို အချို့နေရာများတွင် တွေ့မြင်နိုင်ပါသည်။

သံလွင်မြစ်၊အတ္တရံမြစ် နှင့် ဂျူင်းမြစ်တို့ပေါင်းဆုံရာ သံလွင်မြစ်ဝသည် အသွင်ကွဲစွာတည်ရှိသော ရေမြေသဘာဝကြောင့် ပညာရပ်ဆိုင်ရာ စူးစမ်းလိုသူများအတွက် စိတ်ဝင်စားဘွယ်နေရာ တစ်ခုဖြစ်ပါသည်။

လူမှုစီးပွား၊ယဉ်ကျေးမှု ၊ဘာသာရေးနှင့် လူမျိုးစု

စိတ်ဝင်စားဘွယ်ကောင်းသော နေရာများ ရှိနေခြင်းကြောင့် မော်လမြိုင်ဒေသသည် နိုင်ငံခြားခရီးသွားများနှင့် ပြည်တွင်း ခရီးသွားများ အတွက် ဆွဲဆောင်မှု ကောင်းသော နေရာဟု ဆိုနိုင်ပါသည်။ သံလွင်နှင့် အခြားမြစ်များ၊ ဘုရားစေတီတို့နှင့် ပြည့်နေသော တောင်ကုန်း၊ ကိုလိုနီခေတ် အဆောက်အဦနှင့် အခြားမြေယာ ရှုခင်းများကြောင့် နိုင်ငံခြား ခရီးသွားများ စိတ်ဝင်စားရာဖွယ် နေရာတစ်ခု ဖြစ်နေပါသည်။

၂၀၁၆ခုနှစ် စာရင်းအရ မြို့နယ်အတွင်း လူဦးရေ မှာ (၂၃၈,၃၈၈) ရှိပါသည်။ ၂၀၁၄ ခုနှစ် သန်းခေါင်စာရင်းအရ လူဦးရေမှာ (၂၈၉,၃၈၈) ဖြစ်ပါသည်။ သိပ်သည်းဆအားဖြင့် စတုရန်းရန်း တစ်ကီလိုမီတာအတွင်း (၂၀၂၈.၁) ယောက်နေထိုင်ပါသည်။ ဒေသ ၏ အုပ်ချုပ်ရေးမြို့တော်ဖြစ်သည့်အပြင် ကူးသန်းရောင်းဝယ်ရေး အချက်အခြာလည်း ဖြစ်သောကြောင့် မြို့နယ်အတွင်း လူအများစုသည် မြို့ပေါ် ရပ်ကွက်များတွင် နေထိုင်ကြပါသည်။

၂၀၁၄ စာရင်းအရ လူဦးရေ ၂၅၁,၇၄၃ယောက် (စုစုပေါင်းလူဦးရေ၏ ၈၈%) သည် မြို့ပေါ် ရပ်ကွက်များတွင် နေထိုင်ကြောင်း သိရပါသည်။ ကျန်လူဦးရေ ၂၅,၆၄၃ယောက် (စုစုပေါင်းလူဦးရေ၏ ၁၂%)မှာ ကျေးလက် ဒေသများတွင် နေထိုင်ကြပါသည်။

မော်လမြိုင်သည် ဒေသထွက်ကုန်သီးနှံများကြောင့်လည်း ထင်ရှားပါသည်။ ဒူးရင်းသီး၊ကြက်မောက်သီး၊ နာနတ်သီး၊ ကျွဲကောသီး၊ကမွလာသီးနှင့် မင်းကွတ်သီးများသည် ထင်ရှားသော ဒေသထွက်သီးနှံများဖြစ်ပါသည်။ ဆန်စပါးသည် အဓိက လုပ်ငန်းဖြစ်သလို ယခင်က သစ်လုပ်ငန်းများသည်လည်း ထင်ရှားသော လုပ်ငန်းများဖြစ်ပါသည်။ ရာဘာလုပ်ငန်းသည် ဒေသတခုလုံးတွင် အရေးကြီးသော စက်မှုကုန်ကြမ်း စိုက်ပျိုးခင်း တစ်ရပ်အဖြစ်တည်ရှိနေပါသည်။

ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုဆန်းစစ်ခြင်း, ပတ်ဝန်းကျင်ခြိမ်းခြောက်မှုများနှင့် အင်အားအနည်းပါးဆုံး အစုအဖွဲ့များ

ဒေသအတွင်း မြို့ပေါ်ဒေသများနှင့် ကျေးလက်ဒေသများသည်လည်း ရေကြီးခြင်းကဲ့သို့သော သဘာဝ ဘေးဒဏ်များကို ကြုံတွေ့နေလျက်ရှိပါသည်။ ဖွံ့ဖြိုးရေး လုပ်ငန်းများနှင့် အခြားလုပ်ငန်းများကြောင့် ဖြစ်ပေါ်လာသော ပတ်ဝန်းကျင် ထိခိုက်မှုများက ဤသဘာဝ ဘေးအန္တရာယ်များကို ထပ်လောင်းပေါင်းစပ်အားပေးသလို ဖြစ်နေပါသည်။

နယ်ပယ်အတိုင်းအတာ သတ်မှတ်ခြင်းအခန်းတွင် ရှိရင်းစွဲလုပ်ငန်းများကြောင့် ဖြစ်ပေါ်လာနိုင်သော ပတ်ဝန်းကျင် သက်ရောက်မှုများကို ခန့်မှန်းခဲ့ပါသည်။ ရေထုညစ်ညမ်းမှု၊ ဒီဇယ်တောများပျောက်ကွယ်မှုနှင့် ဒေသခံလူထုတို့၏ စိုးရိမ်ပူပန်မှုများသည် အရေးကြီးဆုံးသော ပတ်ဝန်းကျင်ဆိုင်ရာပြဿနာများအဖြစ် ရှုမြင်ကာ ဒေသ၏ အင်အားအနည်းပါးဆုံး အစုအဖွဲ့များကို သက်ရောက်နိုင်ပါသည်။

အခြေခံ အကြံပြုချက်များနှင့် ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု

ဤကဏ္ဍတွင် ဖွံ့ဖြိုးရေးစီမံကိန်းများ၊စီမံချက်လုပ်ငန်းများတွင် ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ကာကွယ်မှုများ တိုးမြှင့်လုပ်ဆောင် လာနိုင်စေရန် လမ်းညွှန်ထားပါသည်။

ဤအကြံပြုချက်များကို လက်ရှိနှင့်အနာဂတ် တွင် ပေါ်ပေါက်လာနိုင်မည့် မြို့နယ်အတွင်း စီမံကိန်းများ စီမံချက်များနှင့် လုပ်ငန်းများ ဆောက်ရွက်ရာတွင် ထည့်သွင်းစဉ်းစား သင့်ပါသည်။

မြို့နယ်နှင့်ပတ်သတ်သော အဓိက အဆုံးအဖြတ်ပေးသူများ၊လက်တွေ့အကောင်အထည်ဖော်သူများ၊ အကြံပြုထောက်ပြသူ အစိုးရအဖွဲ့အစည်းများ၊ စီးပွားရေးလုပ်ငန်းစုများနှင့် အရပ်ဘက်အဖွဲ့အစည်းများအတွက် လုပ်သင့်လုပ်ထိုက်သော ပတ်ဝန်းကျင် ဆိုင်ရာ အကြံပေးချက်များကို အောက်ပါ အတိုင်း ဖော်ပြထားပါသည်။

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 နားလည် လက်ခံရန် ၊ ဥပဒေစိုးမိုးမှုများကို လေ့လာစောင့်ကြည့်ရန် နှင့် ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ကိစ္စများကို လေ့လာစောင့်ကြပ်ရေး နည်းလမ်းများကို တည်ဆောက်နိုင်ရန်အတွက် မြို့နယ်နှင့် ပြည်နယ်ဒေသ အတွင်း ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အဖွဲ့အစည်း၊ ကော်မတီဖွဲ့စည်းရန်
3. ဂေဟစနစ်မှ ပေးသော ဝန်ဆောင်မှုများနှင့် ဒဏ်ခံနိုင်စွမ်းဆက်စပ်ပုံများကို အခြေခံသော ပတ်ဝန်းကျင်ဆိုင်ရာ အသိပညာပေး လုပ်ငန်းများကို ဒေသခံလူထုအတွင်း ဆောင်ရွက်သွားရန်
4. အမှိုက်သိမ်းဆည်းနည်းများ၊ အမှိုက်ပစ်နည်းများ နှင့် ရေရှည်ဖွံ့ဖြိုးတိုးတက်မှုကို ဦးတည်သော အမှိုက်များစီမံခန့်ခွဲမှု များနှင့် ပတ်သတ်သော အသိပညာပေး လုပ်ငန်းများ ပါဝင်သည့် မြို့နယ်ဆိုင်ရာ အမှိုက်စီမံခန့်ခွဲမှု စီမံချက်များ တည်ဆောက်နိုင်ရန်၊ ထိုသို့ရေးဆွဲရာတွင် အမျိုးသား စွန့်ပစ်အမှိုက် စီမံခန့်ခွဲရေး မဟာဗျူဟာနှင့် လိုက်လျောညီထွေ ဆောင်ရွက်သင့်ပါသည်။
5. ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဌာနနှင့်အခြားဆက်စပ်ဌာနများမှ ဝန်ထမ်းများကို ပတ်ဝန်းကျင်ဆိုင်ရာ ပြဌာန်းချက်ဥပဒေများ လက်တွေ့အကောင်အထည်ဖော်ရေးဆိုင်ရာ အရည်အသွေးမြှင့်တင်မှုများ ပြုလုပ်ရန်
6. ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဌာနမှ ဝန်ထမ်းများကို စီးပွားရေးလုပ်ငန်းများ၏ ပတ်ဝန်းကျင်ဆိုင်ရာ အကောင်အထည်ဖော် ဆောင်ရွက်မှုများကို လေ့လာစောင့်ကြပ်မှုနှင့်ပတ်သတ်သော အရည်အသွေး ဆိုင်ရာသင်တန်းများ ပို့ချပေးခြင်းများ ပြုလုပ်နိုင်ရန်
7. ဖွံ့ဖြိုးရေးလုပ်ငန်းများကြောင့် ပတ်ဝန်းကျင်နှင့် ဒေသခံလူထုတို့၏ ရာသီဥတုဆိုးဝါးမှု ဒဏ်ခံနိုင်စွမ်းကို မည်သို့မည်ပုံ သက်ရောက်မှုရှိနိုင်ကြောင်း ကုမ္ပဏီများ အဖွဲ့အစည်းများမှ ပွင့်လင်းစွာ တင်ပြနိုင်ရေးအတွက်

တွန်းအားပေးရန်

8. မြို့နယ်အတွင်းရှိ ဌာနဆိုင်ရာများ အနေနှင့် ရာသီဥတုပြောင်းလဲမှုများ၊ ရာသီဥတု ပြောင်းလဲမှုများကြောင့် ဖြစ်ပေါ်လာသော ဘေးနှင့်ဖိစီးမှုများ၊ လက်ရှိစီမံကိန်းများမှ နောင်တွင် ဖြစ်ပေါ်လာနိုင်သော ပတ်ဝန်းကျင်ဆိုးကျိုးသက်ရောက်မှုများကို ဖော်ထုတ်နိုင်ရန်အတွက် BRACED စီမံကိန်းမှ ပြုစုခဲ့သော ဗျူဟာမြောက် ပတ်ဝန်းကျင်ဆိုင်ရာ ဆန်းစစ်ခြင်းနှင့် ကျေးရွာလူထု၏ ဘေးအန္တရာယ်ဒဏ် ခံနိုင်စွမ်း စစ်တမ်းများကို လေ့လာသုံးသပ်ရန်။(မော်လမြိုင်ဒေသအတွင်းရှိ အင်အားအနည်းပါးဆုံး ဒေသခံတို့၏ ဘေးဒဏ်ခံနိုင်စွမ်း မြင့်မားလာစေရေးအတွက် ဒေသခံတို့မှာ ရှာဖွေ ဖော်ထုတ်ထားသော လုပ်ဆောင်ရမည့် လုပ်ငန်းများ အားလုံးကို အတူတကွ ပေါင်းစည်း၍ ပိုမိုကျယ်ပြန့်သော စီမံချက်များ ရေးဆွဲသင့်ပါသည်။ ထိုသို့ပြုလုပ်ရာ တွင် အစိုးရနှင့် ပြည်သူတို့ အတူတကွ လုပ်ကိုင်နိုင်မည့် ပတ်ဝန်းကျင်နှင့် ဂေဟစနစ်ဆိုင်ရာ စီမံကိန်းများအတွက် အသေးစားရံပုံငွေများ ရရှိအောင်ဆောင်ရွက်ခြင်းဖြင့် ဇီဝမျိုးစုံမျိုးကွဲ၏ ဂေဟစနစ်ဆိုင်ရာ ဝန်ဆောင်မှုများ မြင့်တက်လာနိုင်သည်" ဆိုသော အချက်ကိုလည်း ထည့်သွင်းနိုင်ပါသည်)

စက်ရုံအလုပ်ရုံများ နှင့် စီးပွားရေးလုပ်ငန်းများ

9. စီမံကိန်းနှင့် စီးပွားရေးလုပ်ငန်းများ၏ ပတ်ဝန်းကျင် ၊ကျန်းမာရေးနှင့် လုပ်ငန်းခွင်ဆိုင်ရာ ဘေးအန္တရာယ်ကင်းရှင်ရေး ဆိုင်ရာ မူဝါဒများ၊ စံနှုန်းများကို တရားဝင်ထုတ်ပြန်ခြင်းဖြင့် ပွင်းလင်းမြင်သာမှုများကို ဖော်ဆောင်ရန်
10. ရပ်ရွာလူထု ဝန်ဆောင်မှုလုပ်ငန်းများ နှင့် စနစ်များ(အစားအသောက်၊ရေစွမ်းအင်နှင့်ကျန်းမာရေး)၊ ရပ်ရွာလူထု၏ အစွန်းရောက် ရာသီဥတုများ၊ ပတ်ဝန်းကျင် ဆိုးကျိုးများအပေါ် ဒဏ်ခံနိုင်ရည်စွမ်းကို မည်သို့သက်ရောက်နိုင်သည် ဆိုသော တွေ့ရှိချက်များကို ပေမျှဖြန့်ဖြူးရန်၊ ဆိုးကျိုးများကို လျော့ပါးစေသော အစီအမံများ ဆောင်ရွက်ရန်
11. ဖွံ့ဖြိုးရေးစီမံကိန်းများနှင့် စီးပွားရေးလုပ်ငန်းများသည် စီးပွားရေး တိုးတက်မှုနှင့် အကျိုးအမြတ် ရနိုင်မှုကို ဦးတည်သော ဘေးဒဏ်ခံနိုင်စွမ်း ဆိုင်ရာ လုပ်ငန်းများ ပါဝင်သည့် စီးပွားရေး ဆောင်ရွက်မှုများ ပိုမိုများပြားလာစေရန်အတွက် တွန်းအားပေးရန် (ဥပမာ- စိုက်ပျိုးရေးနှင့်သက်ဆိုင်သော လုပ်ငန်းများ၊ ရပ်ရွာလူထုအတွက် အခြေခံ အဆောက်အဦများ၊စွမ်းအင်နှင့် ရေ ဖြန့်ဖြူးရေး ဝန်ဆောင်မှု လုပ်ငန်းများ)
12. လုပ်ငန်းခွင်ဆိုင်ရာ ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးများနည်းတူ စီမံကိန်းအနီးတဝိုက်မှ ဒေသခံပြည်သူတို့၏ ကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေးအတွက်လည်း ဆောင်ရွက်ရန်
13. အခြား စီးပွားရေးဆိုင်ရာ လုပ်ငန်းများနှင့်အတူ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနှင့် ပတ်ဝန်းကျင်ညစ်ညမ်းမှုများ ကာကွယ်ရေး တို့သည်လည်း အရေးကြီးကြောင်း သတ်မှတ်ထားနိုင်ရန်
14. တည်ဆဲ EIA လုပ်ထုံးလုပ်နည်း နှင့်အညီ စီမံကိန်းနှင့်ဆိုင်သော ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံချက်များကို ရေးဆွဲအကောင်အထည်ဖော်ရန်
15. စီးပွားရေးနှင့် ဖွံ့ဖြိုးရေးလုပ်ငန်း များကြောင့် ပတ်ဝန်းကျင်ဆိုးကျိုးနှင့် ဒေသခံတို့၏ အစွန်းရောက် ရာသီဥတုဒဏ်ခံစွမ်းရည်များကို မထိခိုက်စေရန်အတွက် မိမိတို့၏ လုပ်သားထုများကို ပတ်ဝန်းကျင်ဆိုင်ရာ သင်တန်းများပေးရန်အတွက် အစီအစဉ်များ ရေးဆွဲရန်
16. ဒေသခံတို့၏ ရာသီဥတုဒဏ်ခံနိုင်စွမ်းရည် မြင့်တက်လာစေရန် ၊ ဂေဟစနစ်မှပေးသော ဝန်ဆောင်မှုများကို ထိန်းသိမ်းရန် နှင့် ပတ်ဝန်းကျင်ဆိုင်ရာစီမံချက်များ ပါဝင်သော လူမှုတာဝန်သိမှု အစီအစဉ်များရေးဆွဲအကောင်အထည်ဖော်ရန်
17. စက်မှုဇုံသစ်တွင် ပတ်ဝန်းကျင်ဆိုင်ရာ ကော်မိတီငယ် ဖွဲ့စည်းပြီး ထိရောက်သောပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှုများ ပြုလုပ်နိုင်ရန် ၊ ထိုအဖွဲ့အတွက်လည်း လိုအပ်သော သင်တန်းများ ပေးနိုင်ရန်

အရပ်ဖက်အဖွဲ့အစည်းနှင့်ဒေသခံလူထု

18. သက်ဆိုင်ဆက်စပ်သူများ အစည်းအဝေးများတွင် ပါဝင်ဆွေးနွေးကြရန်။ မိမိတို့အစဉ်အဆက်တွေ့ကြုံခဲ့ရသော အဖြစ်အပျက်များ ဗဟုသုတများကို ထိုသို့သော ဆွေးနွေးပွဲများတွင် အတွေ့အကြုံဖလှယ်ခြင်း၊ စိတ်ပူပန်သောအကြောင်းများနှင့် ဖြစ်ပေါ်နိုင်သော စိမ်ခေါ်မှုများကို တင်ပြနိုင်ရန်
19. အစိုးရနှင့်အခြားအဖွဲ့အစည်းများမှ ဦးဆောင်ကျင်းပသော အပြုသဘောဆောင်သည့် ပတ်ဝန်းကျင် ဆိုင်ရာ ထိန်းသိမ်းရေး ပညာပေးရေး လုပ်ရှားမှုများတွင်တက်ကြွစွာပါဝင်ရန်
20. စီမံကိန်းအသစ်များ၏ ဥပဒေ ၊လုပ်ထုံးလုပ်နည်းများ နှင့်အညီ ဆောင်ရွက်ခြင်း ရှိမရှိ သိရှိ ရန်အတွက် ပုဂ္ဂလိက လုပ်ငန်းများ စောင့်ကြည့်ရေးလုပ်ငန်းစဉ် ထူထောင်ရန်
21. 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 350,000people 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 350,000people 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 Mawlamyine Township, World Vision, the implementing partner and three technical partners including BBC Media Action, UN Habitat and Myanmar Environment Institute are coordinating activities to strengthen resilience. UN Habitat is improving access to climate and weather and risk information through preparation of climate profile of the region and building capacities and skills of township stakeholders to use risk information in planning processes through the development of Township Disaster Management Plan (TDMP). They have additionally conducted township level and national level carpenter trainings to strengthen skills in safer construction.

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

World Vision has undertaken community resilience action planning in selected villages. Based on Community Risk Assessment, 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 to SEA

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 Mawlamyine 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 reports will continue to serve beyond BRACED project period.

1.4. SEA Methodology

This TEA study will utilize a broad SEA methodology to undertake analysis. 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.

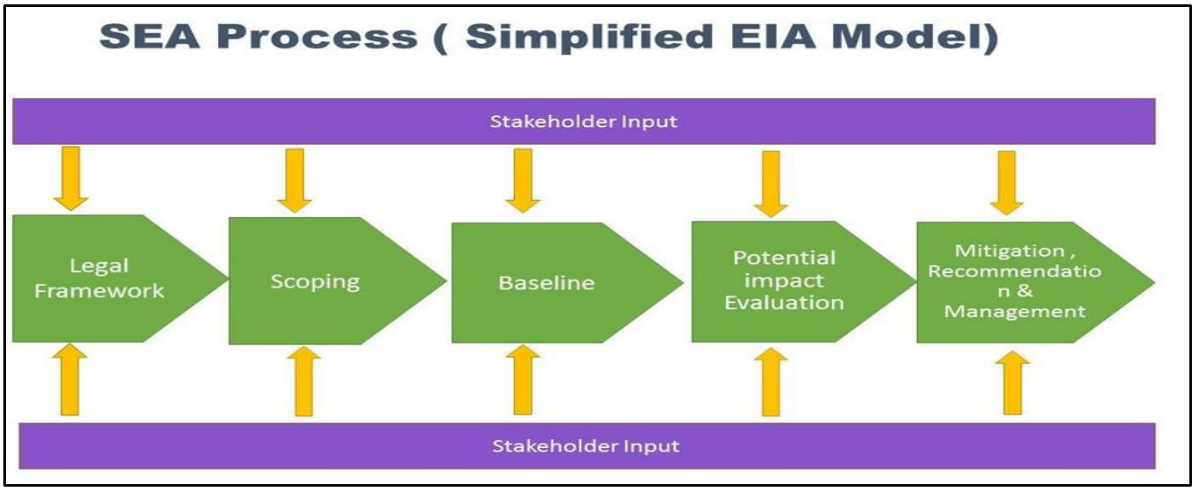
The adopted SEA process is shown as following figure and key elements are described from staring point to the completion of process.

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 environment 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.

Figure 1 SEA Process



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

1.4.1 *Data Collection Methodologies*

The TEA requires review and collection of 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 area and other unpublished data from governmental departments, academic institutions and online search.

Field Data Collection

Field observations were conducted in 2015 to collect primary and secondary data. During the field visits, MEI team principally met local governmental officials and residents.

Stakeholder Consultation and Interview

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

In Mawlamyine, first stakeholder meeting was conducted in June 2015 which was followed by second stakeholder meeting in December 2015. Based on the finding of drafted TEA report, training for implementation was taken place in March 2017 . All events were successfully held in Mawlamyine.

1.5. Limitations

Similar to other areas, major challenge during the study included a lack of secondary resources and information. During baseline observation, the study team was unable manage to visit some significant areas in the township including island and mangrove areas. Thus, the study was centered on Mawlamyine Town and easily accessible surrounding areas. In the absence the information, or insufficient data, experiences of stakeholders shall be mainly taken into account for predicting future trends of the particular issue.

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 in Mawlamyine

The preliminary scoping study was conducted through stakeholder consultation meetings in Mawlamyine Township and a desktop review. Opinions and suggestions from key stakeholders involved in consultation meetings were reflected in the scoping study along with finding from a literature review. Moreover, some information was explored through secondary data collection and informal/formal focus group meeting/ interviews with various governmental officers, villagers and town dwellers.

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

Development and Activities	Key Environmental Issues
Expansion of human settlement and pressure on mangrove community	Mangrove, Terrestrial Ecology
Waste management	Air pollution , water pollution, health hazard
Instream sand mining	River ecology and hydrology
Mawlamyine industrial zone	Livelihood, pollution, health and safety
Tourism	Cultural heritage , livelihood

Chapter 2. Environmental Legislative Framework & Enabling Environment for SEA

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.

2.1. 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.

2.2. 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.

2.3. 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.

2.4. 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

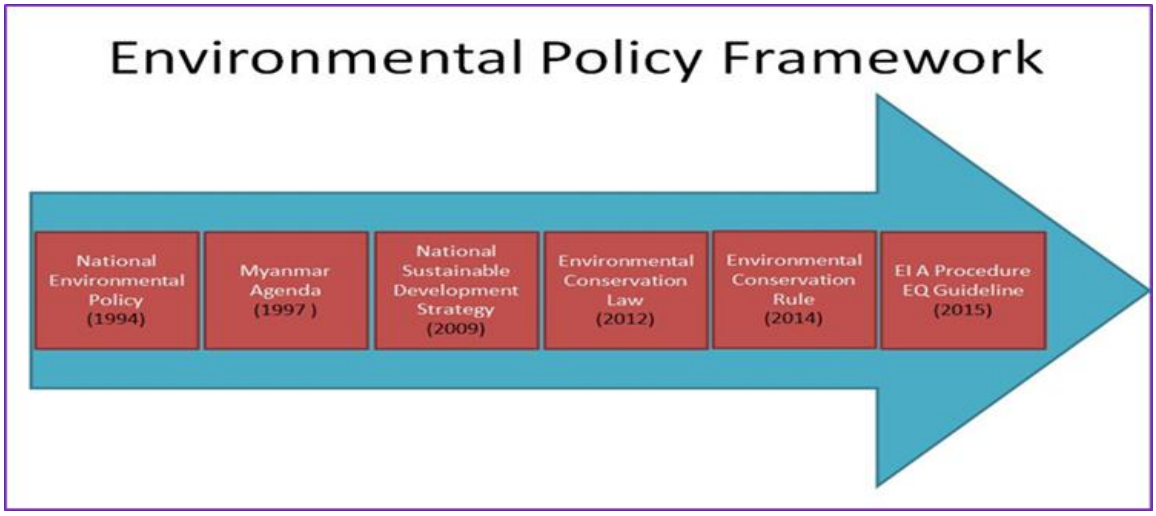
Law and regulation	Year	Major Provision

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	1996	To implement mineral resources policy.

Mines 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



2.5. Institutional Management and Arrangement for Environmental Policy and Strategies

2.5.1 *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

2.5.2 *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.

2.5.3 *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.

2.5.4 *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.

2.5.5 *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[2]

- 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

2.6. 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[3], 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

[2] Need assessment for effective implementation of the environmental conservation law in Myanmar (MOECAF, SYKE, Ministry of Foreign Affair of Finland, UNDP)
[3]2015 EIA Procedure , Government of Union of Myanmar

for undertaking scoping study to identify and access environmental and social impact, provision of monitoring frame work for those of policy, plan and program.

However, this section does not provide enough details on application 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.

2.7. 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

Law & Regulation	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 Virgin Land Law	2012	This law aims at providing framework for effective use of land. Investor can apply land right to the government for basic structure or other investment which would benefit for the sake of state.
National Land Use Policy	2016	This policy was released recently to ensure the systematic land use management and administration of present and future so as to improve food security, water resource development, transportation, business development and to protect environment and cultural heritage.

In connection with land confiscation, little information and guidance is available about streamlining the process of acquiring land in Myanmar. In review of land acquisition act (1894) detailed requirements are not described and followed regulation does not stress the process for the resettlement work. 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.

2.8. Institutional Analysis on Environmental Governance

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

2.8.1 *Township Level Environmental Management*

There is no organized structure for environmental governance and management in Mawlamyine 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. ECD was formed in Mawlamyine 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 Vulnerabilities and Environmental Issue

3.1. Environmental Baseline

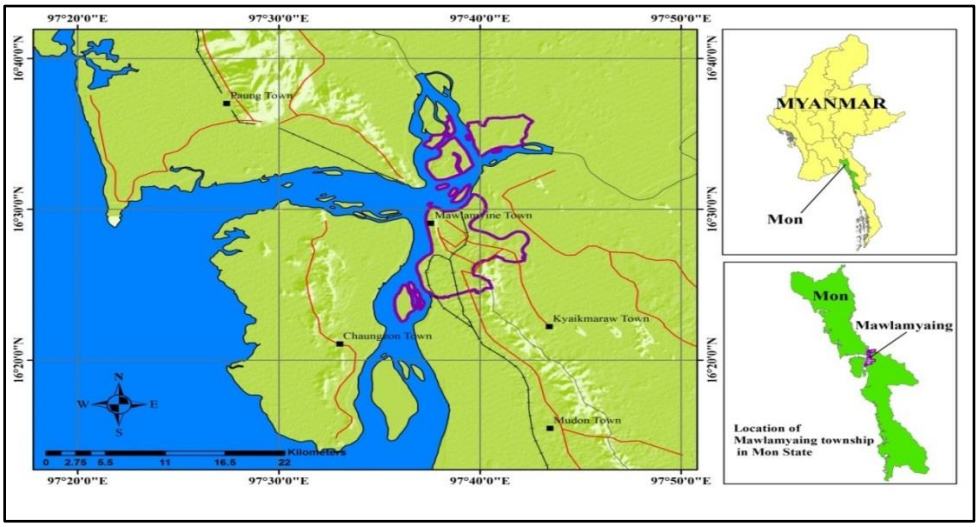
The fundamental objective of establishing environmental baseline information is to understand the current status of environmental and social elements of region and their trends, to realize environmental sensitivity of flora and fauna and to serve as basic environmental reference of region.

3.1.1 *Location of Mawlamyine Township*

Mawlamyine Township is one of the ten townships in Mon State. It lies between latitude16° 21′ and 16° 30′ north and between longitude 97° 35′ and 97° 42′ east. It is located on the Thanlwin River Delta, where the mouth of Thanlwin is sheltered by Bilugyun Island as it enters the Gulf of Martaban and Andaman Sea. The land area of the township is 54040 acres (84.5 sq miles). Mawlamyine Township is bounded by Kyaikmayaw Township in the east, Chaungsone Township in the west and Mudon Township in the south and Hpa An Township in the north. The shape of the township is elongated with north-south extent of 17 miles and east-west breath of 7 miles. It is made up of 28 wards, 13 village tracts and 32 villages. Yankin ridge divides the Mawlamyine town into two portions namely east and west.

From strategic perspective, Mawlamyine is considered a gate way to Andaman Sea for East West Transport Corridor Project.[4]

Figure 3 Location of Mawlamyine

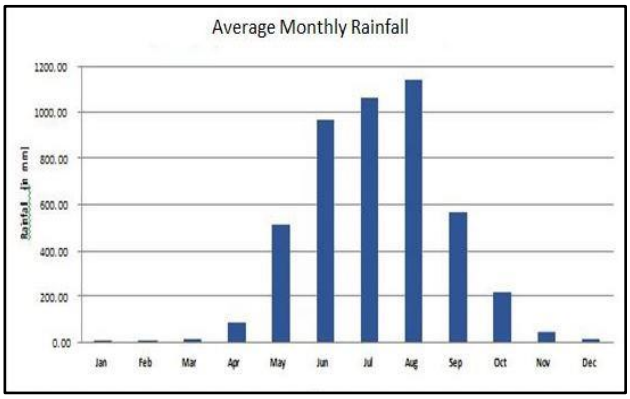


[4]https://www.adb.org/sites/default/files/evaluation-document/35095/files/29271-lao-ppe.pdf

3.1.2 *Climatology*[5]

Being located between latitude 16° 22′ and 16° 30′ north and between longitude 97° 35′ and 97° 42′ East, temperature in Mawlamyine Township is high throughout the year.

Mawlamyine receives rainfall from both Southwest Monsoon and weather systems over the Bay of Bengal and Andaman Sea. Average annual rainfall is around 4638mm; Mawlamyine, as with many other areas in the coastal zone, is one of area with the very high rainfall.

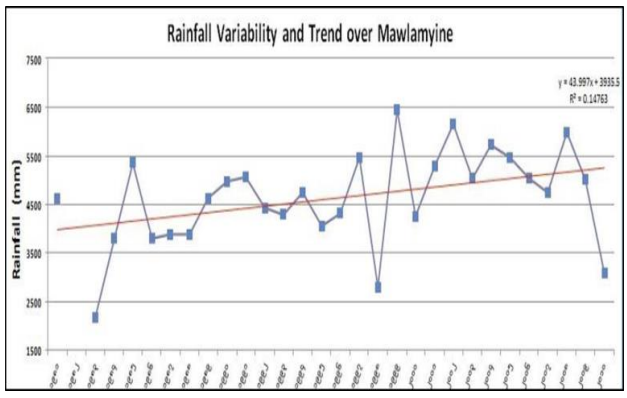


Following climate information about Mawlamyine are referred from Climate Profile report prepared by Regional Integrated Multi-Hazard Early Warning System(RIMES) as a technical partner to United Nation Human Settlement Program (UN-Habitat) , as part of BRACED program. The climate profile report adopts the baseline period of 1981-2010 for deriving climate normal and for other relevant historical data analysis.

In 2014, the maximum temperature is 38.7°C (101.7°F) in April and minimum temperature is 11.4°C (52.5°F) in January. The temperature in this region rises gradually from February to April. As this region lies on the windward side of monsoon wind, it receives plenty of rainfall during monsoon season. Abundant rainfall comes from the southwest monsoon from May to September. Therefore, the area enjoys Tropical Monsoon Climate. Floods occur frequently in June, July and August due to heavy rains.

Rainfall Variability, Extremes and Trends

With an annual average rainfall of 4638mm , the highest observed rainfall was recorded. In 1999, with 6455mm. lowest rainfall was in 1983, registering only 50% of average annual rainfall (2158.60m). In 2014, the total annual rainfall of Mawlamyine Township is 5003.19 mm (197 inches) and the total number of rainy day is 146 days.



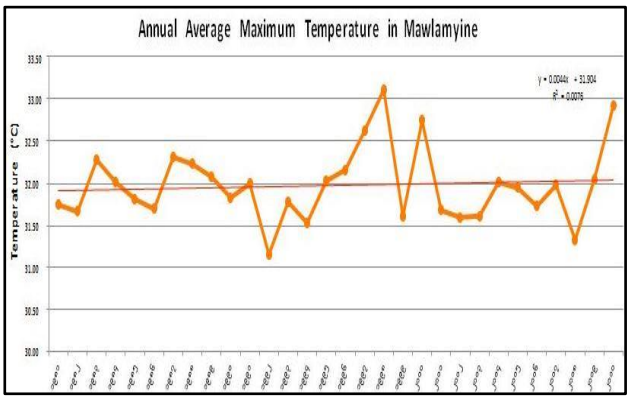
[5] Climate Profile Report, RIMES, UN-Habitat, BRACED Program

Evaluation of the 24-hour rainfall observation data, for 1999, indicates that the rainfall was unevenly distributed over 172 wet days. The highest 24-hour rainfall was in 15 June 2004 (481mm).

Analyzed in percentile, rainfall events of ≥40mm is showing an increasing trend, indicative of the increasing occurrences of extreme 24-hour rainfall. The wet season in Mawlamyine is showing an increasing trend in terms of rainfall amount and number of wet days (averaged at 127 days,) indicating that more years, within the period, received rainfall amounts equal to and higher than the average and more years of wet season rainfall of wet days ≥127.

Temperature Variabilities, Extremes and Trends

The average maximum temperature, in Mawlamyine, is 31.97°C. 1998 recorded the warmest days, on the average, at 33.11°C; the lowest average day time temperature was in 1992 (31.15°C). Of the 30 years of record, three (3) days had maximum temperature of ≥40°C, recorded in April and May. The slightly increasing trend of maximum temperature is also indicated. The night time temperature, in Mawlamyine, is averaged at 22.38°C. The highest average night time temperature was in 1981 (23.03°C). On the other hand, the coolest average night time temperature was in 1992 (21.01°C). The lowest night temperature recorded within the year was 13°C, in 29 February in 1992.



Both day time and night time temperatures are exhibiting increasing trends, suggesting that in general, warmer day time and night time temperatures had been experienced in the period of study.

Wet and Dry Season Rainfall

The wet season in Mawlamyine contributes tremendously to annual rainfall. Averaged over the baseline period, 96% of the annual average rainfall is attributed to the wet season; inter-annual variability however, is high. On the other hand, 1994 recorded the highest wet season contribution to annual rainfall in Mawlamyine, at 99.87%.

The wet season in Mawlamyine is showing an increasing trend in terms of rainfall amount and number of wet days. 1999 also recorded the most number of wet days in Mawlamyine.

3.1.3 *Relief and Drainage*

Mawlamyine Township is lying on a low plain gradually sloping downward to the eastern and western parts of the township area. It is the widest coastal lowland of

Tanintharyi Coastal area. Nagawitha Range is lying in the eastern part of Mawlamyine under north-south alignment. The most famous islands of Mawlamyine Township are Dawei Island and Gaung Say Island.

Mawlamyine Township has a good drainage system. The most important rivers are Thanlwin, Attaran and Gyaing Rivers. The whole township is lying at an elevation of 18 feet above sea level.

3.1.4 *River System and Estuary zone*

The important rivers which flow in the area are Thanlwin, Attaran, Gyaing, Dayeikbauk and Mawlamyine Rivers.

Table 3 River System

River	Particular
Thanlwin River	The most prominent river which flows through Mawlamyine Township is the 2815 Km long Thanlwin River which originates at Tibetan Highland of China and enters into Gulf of Martaban in Andaman Sea. The most famous tributaries are the Gyaing and Donthami Rivers. Thanlwin River (internationally known as Salween River) is commercially useful for navigation, fishery and sand extraction. Upper reach of the river passes through undulating terrains with steep cliffs. It has little commercial value for navigation there. Thanlwin River is among the ten most polluted rivers in the world (The Millennium Project, 2010) as a result of natural resource depletion in upstream riparian and catchment area. Degradation of river water quality is expected to be accelerated with future damming on the river and deforestation and resource extraction in catchment area. Two tributaries, Gyaing and Attaran Rivers have merged with Thanlwin River immediate north of Mawlamyine Town forming a numbers of islands at the river mouth. Thanlwin River is vital for sustaining livelihood, beliefs and culture for ethnic people residing in the river basin and riparian community. Hence, it is regarded as lifeblood of the Kayin State and Mon State as well. Moreover, it enhances the development of enriched fertile floodplain area. Accordingly, it also provides the productive agricultural land for the farmers residing villages along the bank of the river. Varieties of freshwater fishes are available for local consumption. Figure 17 and Figure 18 represent the sceneries of Thanlwin River.
Gyaing	Gyaing River ca river of Kayin State and Mon State, in northern

River	section of Mon State. Its two major tributaries, the Hlaingbwe River and the Haungtharaw River, flow together to form the Gyaing; at. It is about 45 miles long and flows into the Thanlwin River immediately above Mawlamyine Township. Gyaing River borders Hpa An Township in Kayin State and Kyaikmayaw Township in Mon state. It has two major tributaries in Kayin State, known as Hlaingbwe River and Haungtharaw River .These two rivers merge to form Gyaing River. Gyaing River enters the Thanlwin River near Mawlamyine Town, Mon State. This river is tidal river with mixture or salty water and fresh water .The Gyaing is a wide river, but quite shallow with numerous sandbars. It is navigable by smaller boats all year long. Then, it is important river for transportation, communication.[6]
Attaran River	Attaran River is a river of Myanmar (lower part) and Thailand (the uppermost part). In Thailand, it is usually known as the Kasat River. Local name in Myanmar is Pee Ka Dot which means small fish in Mon language. The Ataran and its tributaries begin Three Pagoda Pass near the Thai-Burmese border and flows in general north-north-west direction. It merges into the larger Gyaing River and Thanlwin River near the city of Mawlamyine. A main tributary of the Ataran River is the Zami River. The Ataran and its tributaries begin near the Thai-Burmese border and flow in a general north-north-west direction. It merges into the larger Gyaing River and Thanlwin River near the city of Mawlamyine. A main tributary of the Ataran River is the Zami River. Being Ataran connecting to river mouth of Thanlwin, the river rises and falls with tide. Ataran River is useful for transportation especially during rainy season when roads become bad with mud. Several fish species occasionally observed in market are native to Ataran basin, including the Burmese border loach (Botia kubotai), hump head glassfish (Parambassis pulcinella) and Microdevario kubotai. This river is important of yearly round transportation, agriculture and fishing in local extent for local people.[7]
Dayeikbauk	Dayeikbauks River is one of the two downstream of Thanlwin

[6] https://en.wikipedia.org/wiki/Gyaing_River
[7] https://en.wikipedia.org/wiki/Ataran_River)

River	River. Thanlwin River is split into two distributes namely Dayeik Bauk and Mawlamyine Rivers near Mawlamyine Town before emptying into Mattanban Gulf . The Dayeikabuk Rive has the characteristic of high variation of erosion and sedimentation triggering sandbank and islands along the river. This river divides Chaung Zon.
Mawlamyine River	Mawlamyine River is one of the downstream of Thanlwin River diverging from the point near Mawlamyine town. Both of these distributes provides benefits to riparian and island people residing along the river banks.

Table 4 Topography, Geology and Soil Type

Topic	Particular
Topography	*Highland Area* Prominent highland area in urban are Yankin Hill with peak of 558 feet high and Taungwaing hill in the south east with 800 feet in height . Southern section of township is predominately by Taung Nyo mountain range which is primary source for water distribution for irrigate and domestic use to lesser extent. *Island* Township belongs to a number of islands sitting in area of three rivers confluences . Three major islands are Kawsein, Kawpauk and Kawton Island located in the northern most part of township. There islands are surrounded by some small islands such as Kado and Dawei . During the heavily rainfall and high tide , small islands and some flooded plans are submerged under water . However, rolling topography and slopes favor the excessive water to drain out quickly. *Plain* There are two river side plans which occupy a great deal of township area. These two river side plains are divided by central mountain range .East side of plains is known as Attaran River plain and west side Mawlamyine River plain.
Geology	According to Dr. Coggin Brown's (1925) observation at Yankin Ridge near Mawlamyine, the ridge was a continuation of Mottama Range. He was observed that in the ridge near the Kinmonchone Reservoir, there were exposures of bleaches shaly bands in great quantities, but in the middle and towards the top, no great extent of bleached shaly bands were found. The shaly bands containing products in the ridge were the same as those exposed at Mottama.

	At the extreme end of the Taungnyo Bridge is a granite boss. According to Mr.Leicester, massive blue and grey limestone overlain rocks of the Taungnyo Series. These limestones may be equivalent to the Mawlamyine limestone.[8]
Soil	The common soil types found in the project area are red brown forest soil, lateritic soil and meadow soil. These soils are used for orchards gardens and rubber plantations. The Meadow Soils (Gleysol) are also known as paddy soils. These occur on flat areas and very gently sloping areas, along the Gyaing River and Ataran River. The soil texture is mostly made up of clay alluvium and does not have definite stratification down to 1.5 m from the surface. Generally, the color of the surface soils is yellow brown. These soils can be utilized for rice cultivation. The soils are mostly lateritic on the ridge and meadow gray on the cultivated paddy fields. The plains are mainly formed by the old alluvium deposition of the Thanlwin River and its tributaries. Lateritic soils are common.

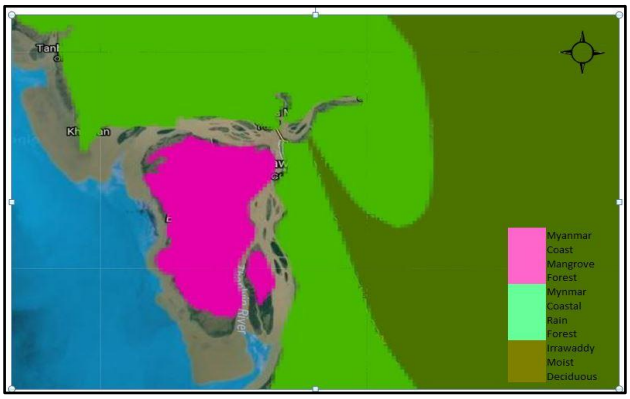
In brief, the whole estuary zone and associated river are impacted by the tide as the area directly connected to the Gulf of Martaban. Therefore, its rise and fall with tide every day. Referring to the assessment of MYOP, Tidal water reached up to 25 Km near Htone Aing village in Thanlwin River, 75 Km in Ataran River, near Choungnakwa village, 60 Km in Gyaing River near Kyundo village .

3.1.5 *Ecoregion., KBA and Protected Area*

Mawlamyine Township falls within ecoregion of Myanmar Coastal Rainforest . The study area is connected with Myanmar Coast Mangrove and Irrawaddy Moist Deciduous .

In term of KBA, southern mountain range of Mawlamyine is regarded one of the high priority KBA with species of ecological interest. Species identified are Asian Brown Tortoise (Endangered) Asiatic Soft-shell Turtle (Vulnerable, Yellow

Figure 4 Ecoregion



Source : https://ecoregions2017.appspot.com)

[8] Dr. Coggin Brown's (1925)

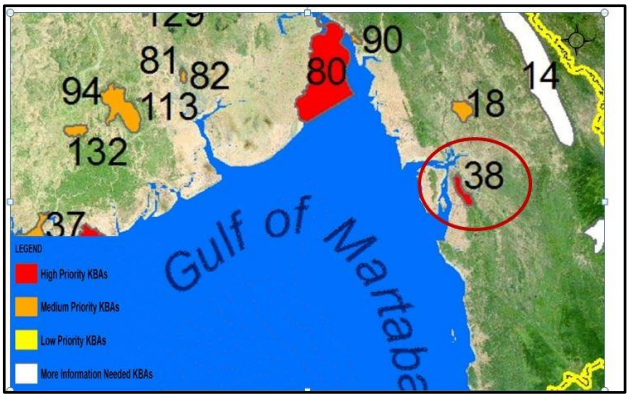
Tortoise((Endangered) Asian Leaf Turtle (Not Threaten) and Green Peafowl (Endangered).[9]

There is no protected area within or in the neighboring environment of township.

3.1.6 *Natural Vegetation*

Tropical evergreen forest and monsoon deciduous forests can be found in Mawlamyine Township because of heavy torrential rainfall. Long time ago, there were a lot of forests covered in Zaygyo quarter, Taungwine quarter and Taung paw tan quarter which are situated in the east and south of Mawlamyine Township. But now, a lot of forests are destructed due to many purposes such as construction, agriculture, land use conflict and many other factors. Only few big trees have been reserved in the Taungwaing Hill. Pyinkado, Padauk and Teak trees are found in some parts of Mawlamyine Township.

Figure 5 Key Biodiversity Area



Source: WCS Myanmar

Monsoon deciduous forest type is observed in northern part and tropical evergreen forest are discovered in southern regions of township.

Natural vegetation which can be found in Mawlamyine township are Pyinkado (Xylia xylocarpa), Padauk (*Pterocarpus macrocarpus),* Teak (*Tectona grandis*), Anan (*Eagraeafragrans*), In (*Dipterocarpus tuberculatus*), Kokko (*Albizzia lebbek*), Sit *(Albizzia lebbek*), Panga (*Terminalia chebulla*), Taukkyan (*Terminalia tomentosa*), Taung-thayet (Mangifera caloneura), Thabye (*Eugenia spp.*), Yon (*Anogeissus acuminata*), Didu (*Salmalia insignis*), Lettok (*Sterculia foetida)* and Letpan (*Salmalia malabarica)* etc.

Large trees which are found mostly are Padauk, Kokko, Nyaung, Kayay, Ngu, Mayan, Mango and Gantgaw trees. Although they include in large tree group, their height ranges from 5feet to 20 feet. Small trees and shrubs such as bushes, Kyet-ket-sone tree, cotton and other small trees are also found. In Municipal land of Mawlamyine Township, natural vegetation is not found. But in Mawlamyine Township, forest and natural vegetation can be found.

Evergreen forests thrive in the region as it is located in the tropical climate zone. Marshes grow along some coastal plains and bank of river and creek. In trees

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

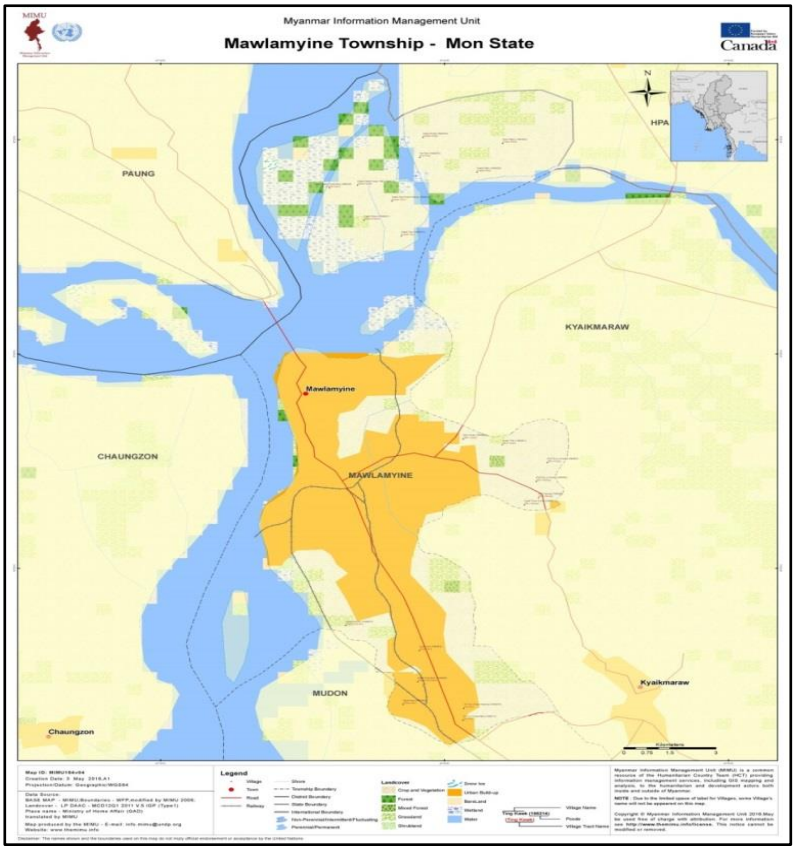
(*Dipterocarpus tuberculatus*) grow on Laterite-like land in areas east of Mawlamyine. Mangroves can be found near mouths of tidal rivers and creeks.

Nowadays, nearly half of central Mawlamyine Township is covered with built up area. Small patches of grassland and wetlands remain in the southwest of township whereas a great deal of wetlands thrives on the inlands and along riverbanks in estuaries area and Mawlamyine River.

3.1.7 *Thanlwin Estuaries & Wetland*

Northern fringe of townships is dominantly by rivers and island which were formed at the confluence of Thanlwin River and Gyaing River. Several wetland areas are developed in these islands. Wetland habitats are utmost important for both aquatic and terrestrial wildlife. It provides shelter, food chain, spawning ground for aquatic fauna and much more. Wetland types found in this area are mangrove with mudflat land ecosystem. Wetland is a land area that is saturated with water either permanently or seasonally with distinct ecosystem.

Figure 6 Habitat Map of Mawalmyine



Source: MIMU

Wetland is environmentally and ecologically important habitats for a disproportionately high number of endangered and threatened flora and fauna species. The wetland vegetative community is determined by climate and wetland hydrology. Wetland plant species are established based on their water regime requirements .Plant species and diversity, in turn, have a direct effect on which wildlife will use the site. Species diversity and abundance may vary greatly among different wetland locations and within a single wetland. Many emergent plant species are sensitive to changes in water levels in excess of the wetland's natural hydro period.

Mouth of Thanlwin is also estuary composed of four tributaries namely Gyaing, Attaran , Dayebauk and Mawlamyine River .

Estuaries are the tidal mouth of a large river where freshwater of stream and salty water of ocean mingled. Hence unique ecosystem has thrived in this area. It normally hosts the most biologically productive system on Earth , They are also home to certain types of plants can flourish in the physical conditions peculiar to estuaries, and each of these plants can grow in only certain parts of the estuary. Concentration of salinity in water is one of the factor influencing the distribution and growth of fauna species.

Mangroves are a characteristic forest type in tropical river estuaries and a principle component of delta ecosystems. Mangroves not only act as a critical buffer to tidal storm surges, they provide ideal nursery grounds for fish species and support wildlife species.

According to the habitat map produced by Myanmar Information Management Unit (MIMU) , there has been certain numbers of wetlands are identified at the estuaries of Thanlwin River as shown in following Figure. Those wetlands are surrounded with some degraded mangrove.

3.1.8 *Terrestrial Fauna Species*

According to the various data sources and field observation, there is no terrestrial fauna species of ecological interest are present in the area. The fauna species recorded by different sources are listed below.

Avian Fauna

The most common resident birds include insectivorous species like Striated Babbler (*Turdoides earlei*),Plain Prinia (*Prania inomate*),Asian Palm Swift (*Cypsiurns balasineisis*),Common Tailorbird (*Orthtomus sutorius*),Spotted Dove (*Streptopelia chinensis*),Gree Bee-Eater (*Merops orientalis*),Plain Martin(Riparia paludicola),Grey-breasted prinia (*Prinia hodgsonii*) and Asian barred Owlet (*Glaucidium cuculoides*) as the insectivorous group were identified northern section of township was found in the bamboo grove near Za Tha Pyin village . Asian barred Owlet (*Glaucidium cuculoides*) Asia Fairy bluebird (*Irena puella*) as the fruitvorous was identified in this survey area. List of species are described in appendix section.

Butterfly Species

Butterflies are basically considered as important indicator of biodiversity status of specific location. Presence of abundant and diverse species indicates the status of biodiversity of region. Butterfly serves as an effective pollinator for plant species. The interrelationship between butterfly and flora species is important in maintaining and harmonizing the ecosystem of habitat. Pollination process of the flora is largely influenced by activities of butterflies transferring pollen from male part to female part of plant for reproductive process of plant species. Recorded butterfly species in Mawlamyine Township are described in appendix section.

Dragonfly Species

Various dragonfly species are reported in Mawlamyine Township. Species identified in area are common and not conservation interest. List of dragonfly species is described in Appendix section.

Reptilian and Amphibian species

Recorded reptilian and amphibian species identified in 2015 are listed in Appendix section.

Recorded Fish Species

Being an estuary, rivers in this are with blackish and fresh water mixture with more and more salinity in the far downstream area. Closing to Gulf of Mattaban, rivers are affected by tidal movement on a daily basis. High tide takes four hours and low tide takes 8 hours. Tidal movement and salinity water reach up to 75 km from Thanlwin River mouth.

A qua ecosystem is enriched in this blackish water zone where is best place for reproduction with abundant spawning grounds and aquatic food web. Phytoplankton which is also primary food source for both blackish and freshwater fish species largely thrives in this area. Hence, various fish species can be identified in Thanlwin River, Gyaing River, Attaran River, Dayeik Bauk River and Mawlamyine River.

3.1.9 *Prawn and Shrimp Resource*

During the survey conducted by two scholars[10] from University of Mawlamyine from October 2008 to May 2011 in Thanlwin River mouth and surrounding area, a total of 36 species belong to 13 genera and 6 families were recorded.

Fishing activities in the area are carried out by fishermen all the year except from inclement weather condition. Monthly catch rate are high in Mar- May and low in September - December.

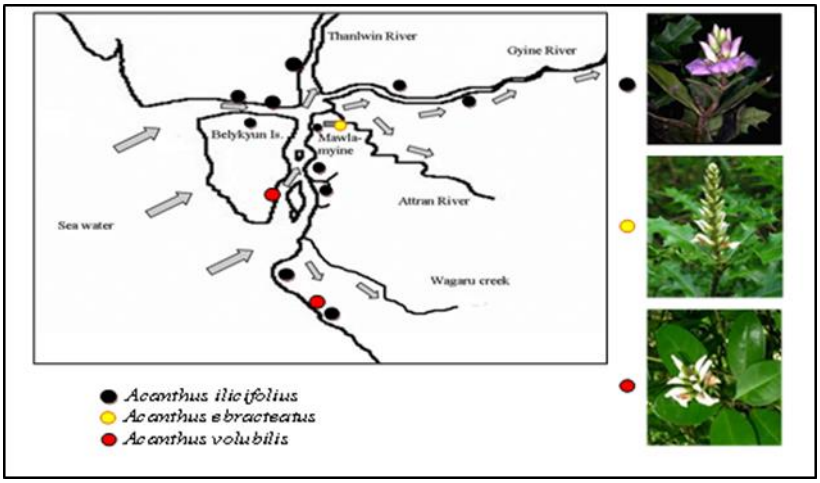
Generally three types of habitats provide food, shelter and spawning ground for prawn and shrimp in surveyed area. Those are categorized into brackish water, fresh water and gradient water.

Upper freshwater (Mon and Kayin State) and gradient water (confluence of Thanlwin and Gyaing River) are places with several species of *Mircobrachium.* Among M*acrobrachium, M.Rosenbargiii* and *M.Villosimanus* are predominant species.

3.2. Mangrove Reforestation in Mawlamyine Township, Mon State

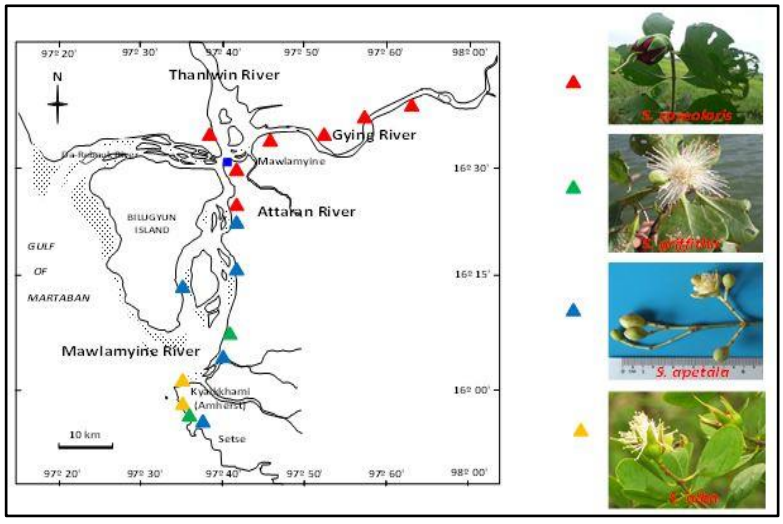
Mangroves are characteristic littoral and tidal influenced plant formations of tropical and sub-tropical sheltered intertidal areas. It can be found in creeks, rivers, estuaries, deltas, islands and lagoons. It is also one of the productive ecosystems of coastal areas. Globally, the area is about 18 million hectares. Myanmar has mangrove areas of about 530,000 hectors, 425,000 hectors. 46% is in Ayeyarwaddy Region, 37% is in Taninthayi Region including Mon State and 17% is in Rakhine State. There are 55 species of major and minor mangroves fewer than 39 genera belonging to 29 families recorded in Thanlwin estuary. Among them the plants belonging to *Avicenniaceae* and *Sonneratiacea*e are dominant than other groups (families) in this area.There are distribution of genera such as *Avicennia* (Theme'), *Sonneratia* (Lamu) and *Acanthus* (Kha-Yar) along upstream and downstream of Thanlwin River and occurrence of rare and locally restricted mangrove species.

Figure 7 Mangrove Species in Estuary and Coastal Area



Mangrove areas of Myanmar are 7th position in the world (4% of the world mangroves) and 3rd position in South East Asia (8.8% of South East Asia mangroves). About 65 species of major (core) mangroves have been found along tropical and sub-tropical coastal areas. Myanmar has about 40 species of major mangroves. Thanlwin River Mouth is subjected to be one of the scientific interests for its unique hydrological characteristics. It is the centre point of the mouth of Thanlwin, Attaran, and Gyaing which is near the Mawlamyine, capital city of Mon State.

Figure 8 Mangrove Species in Estuary & Coastal Area



It is generally hypothesized that the luxuriant and rich floral diversity were found in brackish water areas. It is also observed that the mangroves of Thanlwin estuary were found to occur as mixed vegetation type and *Avicennia* spp. and *Sonneratia* spp. are also dominant. Distribution of mangrove species depends on the salinity gradients. It is needed to monitor the salt water intrusion or salinity regime of the Thanlwin River estuary. It is also needed to study phenology (flowering and fruiting periodicity) of mangroves in this area. Some forested area has already been reclaimed for Nypa cultivation, solar salt operation and aquaculture pond construction.

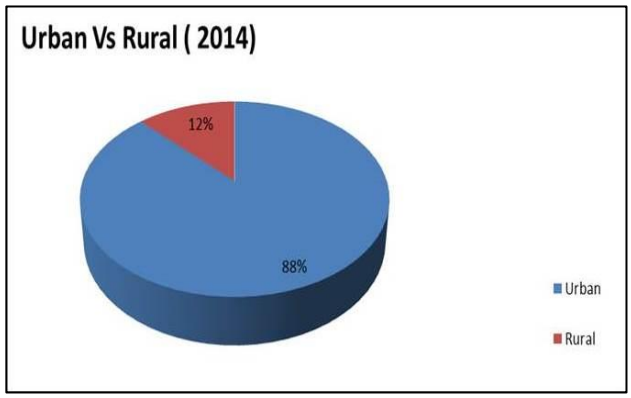
Encroachment of local communities causes destruction to plant community as well as habitat loss/loss of ecosystem value. It is urgent need to conserve or manage sustainably our valuable greener resource not only in Thanlwin River estuary but also the whole coastal areas.

3.3. Social Environment

Social environment generally covers the factors related to population, race, religion, education, health, water supply, sanitation, waste, land use, economic activities, transportation, trade and communication.

3.3.1 *Population*

Population is one of the important socio-economic conditions of a township. In 2006, the total population of Mawlamyine was 238,388 persons[11]. Total population of Mawlamyine Township in 2014 was 289,388 with population density of 2, 082.1 inh./km[12] significantly higer than the country's population density of 81.82 inh/km[2]. The township hosts total household of 57,457.[13]



Being an administrative and trading hub of the region, the majority of populations resides the urban area.

In 2014, altogether 253,743 (88%) people out of the total population lived in the urban area while the remaining 35,643 persons (12%) resided in the rural area. The

[11] Y.M.Pike & W.Win /GMSARN International Journal 10(2016) 187-196

[12] Census Volume 3 , Mon State, The 2014 Myanmar Population & Housing Census, Ministry of Immigration & Population, 2015

[13] Census Volume 3 , Mon State, The 2014 Myanmar Population & Housing Census, Ministry of Immigration & Population, 2015

higher proportion of urban population is due to the presence of commercial and other economic activities.

People are mostly concentrated along the Lower Main Road, whereas the new extensions are sparsely populated. Aukkyin and Shwedaung wards are the most densely populated wards with of 24,456 and 22,780 respectively in 2014. The distribution of the population is uneven with heavy concentration in wards of Hlaing and Aukkyin. The areas with moderate population density are Mandalay and Myinetharyar ward. The population density is least, particularly in the Zayarmyine ward.

The population of Township has always been increasing year by year mostly by natural growth rate and migration.[14] It is expected that the bridge over Thanlwin River connected between Mawlamyine and Chanungson Town Ship is already finished and population in the Mawlamyine is forecasted to increase.

3.3.2 *Ethnicity, Religion and Culture*

The ethnicity of Mawlamyine is comprised of Mon, Bamar, and other ethnic groups. Bamar is the largest ethnic group. The religions are Buddhism, Christianity, Islam and Hinduism. Mawlamyine is key to communications in Tanintharyi and, being a busy seaport and transport center, it provides a multicultural dimension despite a Buddhist Mon majority. Buddhist cultural dominance is as old as Mawlamyine, but the British annexation in the 19th century introduced Christianity. St Patrick's School, Mawlamyine (now BEHS-5, Mawlamyine) was opened by the De La Salle Brothers in 1860. Moreover, expansion of trade and commerce in the early 20th century established in Mawlamyine by a Hindu culture of India (so-called Galakhar).Today, the Mon State Cultural Museum is opened in the city.

Mawlamyine is rich with places which draw many attentions of both tourist and domestic travellers as it is filled with many interesting hotspots to visit and enjoy. Thanlwin River and other rivers, Stupa capped hill, colonial era- buildings and other landscapes are the major tourist destinations. St. Gabriel and St. Matthew and St. Augustine Churches, clock tower, Mawlamyine prison are among the interesting colonial buildings. Yadanarbonmyint Monastery, Kyaikthanlan Pagoda, U Zina Pagoda, Guaung Se Island are the most interesting cultural and religious sites to visit.

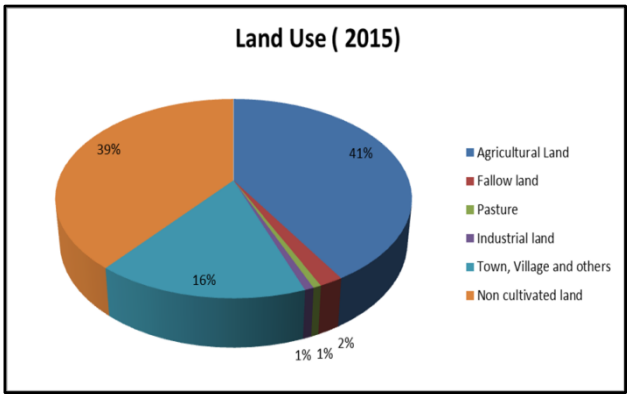
3.3.3 *Land use in Mawlamyine Township*

Types of land use are specified by Surveying and Land Record Department of Mawlamyine Township according to 2005-2006 agricultural statistics.

[14] Y.M.Pike & W.Win /GMSARN International Journal 10(2016) 187-196

The total area of the township is 54069 acres. Of this some 13838 acres is taken up with water surface. In 2005/2006, actual arable land area of Mawlamyine Township was 24690 acres (13574.3 hectare). It is 63% of total land area (42033 acres).

In 2015, the total agricultural land use of Mawlamyie Township amounted to 22,358 acres or 41 percent of the whole township area, of which the non cultivated land was 21,222 acres. There are 16 percent of town, village and others land, and 2 percent of "fallow land" in Mawlamyine Township. Types of agricultural land use on arable land are Le land, Kaing/ Kyunn land, Garden land, Rubber land and Nipa land. Therefore, garden land and "le" land are the largest agricultural land in Mawlamyine Township.



3.3.4 *Industrial Zone*[15]

Mawlamyine industrial zone is located about 15 Km east of Mawlamyine near Attaran River. It started operation in 2005 with 86 enterprises. Major businesses within estate are food stuff, consumer goods, household accommodates, stationery and printing, industrial and raw material, metal and oil product, agricultural equipment, machine and spare parts and other general industries. Only 41 % of total registered enterprises are in operation on 171.04 acre .The majority of enterprises focus only markets within Mon, especially Mawlamyine, and only about 7 percent of total enterprises have linkages with international markets, mostly in rubber-producing businesses. It offers about 450 job opportunities for operation and maintenance of industries.

Figure 9 Mawlamine Industrial Zone (Old)

[15] Pilot Assessment of Industrial Zone in Myanmar , GIZ, MDRI CESD

Mawlamyine industrial zone supervision committee chaired by the Minister of Electricity and Industry of Mon State government, the Minister of Mon State Municipal Affairs as deputy chairman, and the district general administrator as secretary was established to oversee and provide guidance over the development and operation of the industrial zone. Other members are owners of enterprises, apart from the finance officer of the committee. For decision-making, a simple majority vote of fifty percent is needed. One permanent full time staff is working on the day-to-day administrative tasks of the industrial zone management committee.

The industrial zone lacks services for waste management and wastewater management and there is no logistics service. Power shortage is the major challenge for enterprises, especially in summer. Draining systems is not well established in the estate. Basic infrastructure such as clinic, fire brigades and waste management facilities are not provided. It is apparently that the industrial estates have been experiencing a serious of challenges for the development. Major challenges are electricity supply, water supply, limited transportation (bridge capacity). Since there is no public water distribution system in the industrial zone, enterprises have to rely on their own well-tubes. However, it is hard to get underground water, especially in the hot season, even though the industrial zone is located beside Attaran River.

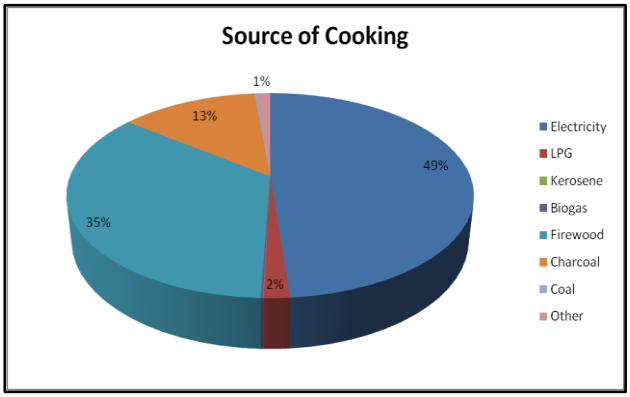
3.3.5 *Infrastructure*

Electricity

Mawlamyine uses electricity from Ngan Tay Electric Power Plant. It is situated on Kyaik-ma-yaw road. Now, new private electric power plant is establishing in NganTay to support electricity to Mon state, Kayin state and Thanintharyi division.

Source of Cooking [16]

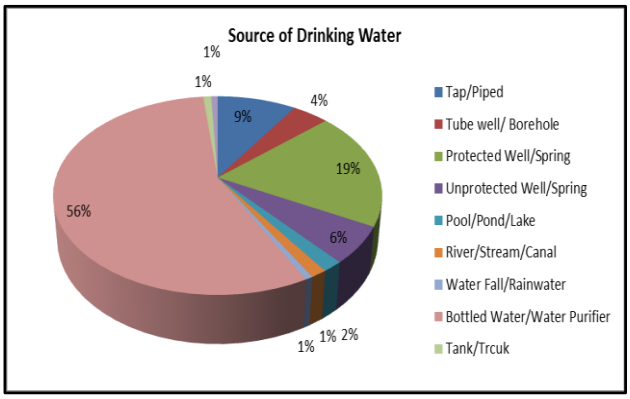
Most inhabitants in Mawlamyine use electricity for cooking (49%). Some use charcoal (13%) and firewood (35%). comparison to other townships of BRACED program, Mawlamyine has the highest users of electricity for cooking among the project townships.



Water Supply

16 Census Volume 3 , Mon State, The 2014 Myanmar Population & Housing Census, Ministry of Immigration & Population, 2015

Kin Pon Chon dam has been used as major utility water source since 1920. Currently four water sources have been supplying water to public distribution network which include Kin Pon Chon Dam, Shwe Nat Taung Dam, Attaran River 1 and Attaran River 2 transmitted through gravity and pumping methods. Mawlamyine City Development Committee (MCDC) adopts sedimentation process utilization natural lagoon-type pond as sedimentation basin can be recognized. But no other purification process is applied throughout the system.



The water used for cooking is from reservoir, tube well and rain water and some houses have own artesian wells for cooking and drinking.

Currently households of Mawlamyine use bottled water in most as drinking water (56%). Other major sources of drinking water protected well (19%) and tap/ piped water (9%).[17]

Transportation

One of the major emphases has been placed on construction, renovation and maintenance of roads and bridges in all States and Divisions.The Thanlwin Bridge is the longest bridge in Myanmar. Mawlamyine is the main gateway to south-eastern Myanmar. Thanlwin Bridge, the longest road and rail bridge in Myanmar is the most prominent landmark in the area. It stretches 11,000 feet over the Thanlwin River connecting the country's south-eastern region with Yangon. It is constructed at the confluence of the Thanlwin River, the Gyaing River and the Attayan River in Mon State, the bridge supports a 3.2 km long motor road and a 6.4 km long railroad, as well as pedestrian lanes. The total length of the rail bridge is 7.640 km. The bridge was designed and built by the Ministry of Construction. The city is connected to Hpa An in Kayin State and Dawei and Myeik in Tanintharyi Region by road. It was the rail head to Ye, linked to Yangon by rail only from Mottama (Martaban) across the river by ferry, but the link connected by the Thanlwin Bridge (Mawlamyine) opened in April 2006. Mawlamyine Airport has regular flights to Yangon. Before 1988, there was old railway station in Mutpun ward. At oresent, there is a new railway station in Myenigone Ward because Thanlwin Bridge is constructed.

[17] Census Volume 3 , Mon State, The 2014 Myanmar Population & Housing Census, Ministry of Immigration & Population, 2015

The airport includes in the urban area of Mawlamyine City lying in Zegyo near the foothill of Taungwaing Ridge. The total land of transportation has 3.48 km² (862 acres) and 6.6 of urban area, including land under airfield 0.17 km² (43 acres) railway 1.26 km² (311 acres) and road 2.05 km² (508 acres).

3.4. Socioeconomic Condition of Mawlamyine Township

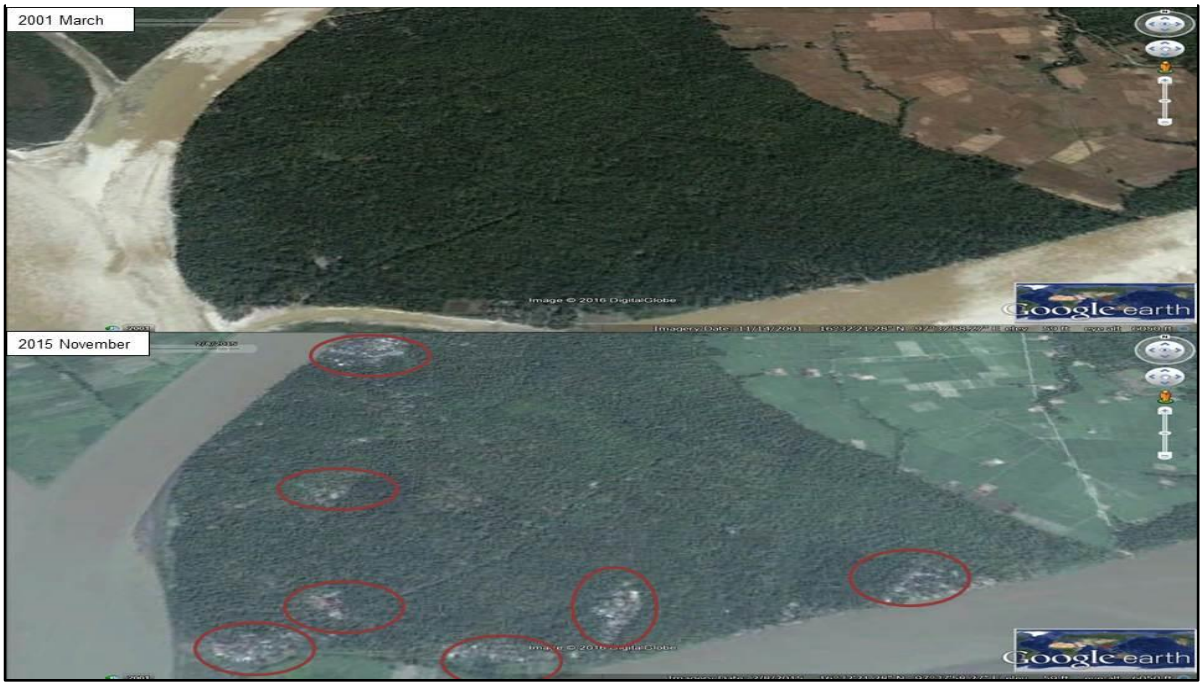
Mawlamyine is famous for its tropical fruits and for its cuisine as indicated in the popular Mawlamyine has several sawmills and rice mills as teak and rice are transported down the Thanlwin. The main crops are paddy and rubber. In addition, orchard crops such as durian, rambutan, mangosteen and pomelo, pineapple, citrus fruits and avocado are grown for economy. Corn, groundnut, sunflower, beans and pulses, tapioca, sugarcane, coconut, oil palm, cocoa, condiments, cashew, nipa palm and fruits are other farm products of Mon State. The water for cropping is usually provided by rain water and water from the Shwenattaung reservoir. The following table shows a comparison of per capita income status for Mon state and Mawlamyine Township. This table shows per capita in Mawlamyine remains less than that of Mon state as a whole.

3.5. Environmental Issue and Analysis

3.5.1 `*Environmental Impact by Human Settlement on Mangrove Ecosystem*

Mangrove ecosystem is utmost important as natural barriers from storm surge,

Figure 10 Human Settlement between 2001 & 2015



Source: Adapted from Google Earth

tsunami wave and flash flood. In addition, mangrove provides the livelihood,

thrives ecosystem, serve as carbon sink and climate change mitigation and disaster mitigation. Mangrove forest has the capability of storing carbon than tropical forest.

However, referring to history of mangrove deforestation acquired from Google Earth free version, a majority of mangrove forest in the Mawlamyine Township have been dramatically degrading over the past years .Human settlement is major drivers leading the deforestation in the area. It is followed by expansion of agriculture land and exploitation for fuel wood and timber. Increasing Eco footprint and pressure on the existence of mangrove forest in the region is one of the major challenges facing in these days.

To understand the general trend of human settlement of the region, comparative analysis was carried out using sequence of image acquired from Google Earth free version.

These figures show the extensive level of human encroachment for settlement in the

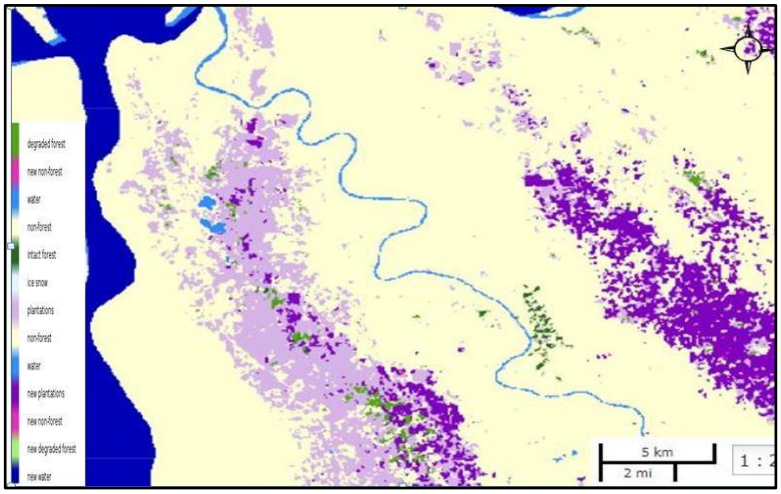
Figure 11 Human Settlement between 2001 & 2014

Source: Adapted from Google Earth

Thanlwin River tributary area on an island. It is obvious that in 2001, there was a few buildings on the island .However, a notable numbers of residential houses has been built during 14 years indicating increase human settlement on the island. Similarly, it is obviously observed the growth of human settlement on small island in Thanlwin estuary comparing between 2001 as per 2015 Google map shown figure.

Although Mawlamyine is indicated as one of the high priority KBA, the following land cover change detection map refers that significant areas have been affected by plantation and land cover have been totally altered . Forest areas were converted into plantation and agricultural land.

Figure 12 Forest Cover Change (2001-2014)



Source: Alarm,EcoDev, EU, MERN,IUCN, Smithsonian, gmap, American Museum of Natural History

Table 5 Human Settlement and Environmental Impact on Mangrove System

Element	Description
Current and Future Trend	With increased population in urban area, more and more people tend to settle in the coastal line and island. Removing of existing degraded mangrove vegetation are threaten.
Environmental Impact	• Loss of mangrove habitat • Depletion of natural resource • Loss of the habitant of endangered species • Disruption to the aquatic ecosystem and food web and reduction in fisheries productivity • Damaging spawning ground • Prone to natural hazards such as flood and decrease resilience to natural disaster
Climate Change and Linkage Impact	Removal of mangrove forest area results in loss of carbon sink and natural barriers.
Recommendation	• Identification of mangrove forest area and monitoring the trend • Protection of environmentally sensitive mangrove forest through existing legislative framework and public awareness • Encourage reforestation and restoration in the disturbed area. • Establish administrative capacity to oversee and manage

	the mangrove • Promote public awareness the importance of mangrove forest ecosystem and linkage to natural disaster. • Considering establishment of buffer zone between mangrove forest and residential area

3.5.2 *Environmental Impact by Enhancement of Tourism Sector*

Enriched with natural beauty and landscape, historic building and cultural heritage sites, being a transport hub and third Great Mekong Sub-region corridor town, tourism sector in this region is predicted to be significantly grown in the near future. Major receptors that are affected by enhancement of tourism are divided into physical, religious and cultural environment and social environment.

Key activities involved in tourism sectors are construction of accommodation and road, establishment of entertainment venues, expansion of facilities, heath care service, sightseeing,. A growth of the tourism sector i will bring the following benefit to region.

- Employment opportunity and alternative income for local people
- Increased revenue for local and union government
- Improve the social status of community.

Table 6 Enhancement of Tourism Sector and Environmental Impact

Element	Description
Current and Future Trend	As such, both local and international tourists come and visit Mawlamyine to enjoy nature, to explore ethnic lifestyle and to seek unique culture of this tranquil environment. Significant improvement in peace and stability in the region has guaranteed the safety and security of visitors. It is perceived that tourism sector of Mawlamyine would be developed further into types of environment based tourism and cultural based tourism in the future. Along with the influx of tourists and local pilgrims, construction works for the basic infrastructures will be intensive.
Environmental Impact	Probable environmental impacts to be caused by development of tourism are predicted as follows. ***Physical Environment*** • Loss of biodiversity and disturbance to natural habitats due to greater access to remote location • Disruption to landscape scenery and by construction of hotels and restaurants • Air, water , and soil quality degradation due to the increased waste volume generated by tourism sectors such as hotels, restaurants , transportation service.

Element	Description
	• Water pollution owing to inadequate waste treatment facilities with increase tourist population • Visual impact and disturbance to land scape and scenery is this due directly to tourism • Increased access into ecologically sensitive area especially to remote location • Increase pressure to weaken waste management service and impact to water quality by the accumulation of waste generated by tourist. • Increase pressure to the social service such as hospital, road and water supply • Air pollution through the boost of vehicle movement used by tourist ***Social and cultural environment*** Major positive economic benefit is expected as a result of increased regional. Local business such as gift shops, restaurants, accommodation and transportation sectors are expected to increase through tourism development. Extension of road network to provide the smooth and convenient transportation could also have negative impact to local community through land grabbing, noise, dust generation and increase of road accident rate.
Climate Change and Linkage Impact	With the growth of tourism sector, the local business is expected to be thriving including the income of local community. Increased income and income diversification can support the enhancement of vulnerable local community's resilience to the adverse consequence of climate change extremes through building well-structured accommodation, ensuring food security and knowledge about the climate change.
Recommendation	In order to ease environmental, social and cultural concern by tourism development, following recommendations are made: • All Hotels , inns, restaurants and other accommodations should be equipped with basic waste treatment facilities , • Enforcement should be made by authorities concerned with existing environmental legislation • Adequate waste collection points should be allocated in the tourist hotspots and waste collection systems including transportation to depot • Careful selection of location for new infrastructure such as

Element	Description
	accommodation and restaurant reasonable distance from sensitive areas • Prioritize expansion and upgrading of existing road instead of planning new access roads • Restoration of historic building which have been left for year without proper restoration and renovation • Issuing guidance note, leaflets in hotel and inns for visitors to avoid any detrimental impact to flora and fauna • Training to local people for employment in tourism sector such as area tourist guide, staff in hotel and restaurant business and environmental protection in the sector

3.5.3 *Environmental Impact by Mawlamyine Industrial Zone*

However, existing industrial location has some issues such as logistics and transportation, load capacity of suspension bridges and remoteness, waster scarcity and poor electricity supply consideration was made for the development of new industrial zone covering about 254 acres.

The newly constructed industrial park is located to the southwest of Mawlamyine on the bank of Thanlwin River near Kyauktan village as shown in the figure.

The industrial zone features a variety of different business enterprises, including zinc, barbed wire, ready-mix cement, food and drink production, textiles, gold purification, ice factories, shoe production facilities, furniture enterprise, plastic enterprises, cool seafood storage and car accessory businesses.

Figure 13 Kyauktan Industrial Park

Source: Adapted from Google Earth

Basic industrial zone infrastructure, including roads, bridges, water and electricity supply have recently been completed after a construction period of two years. [18]

[18]http://www.globalnewlightofmyanmar.com/new-industrial-zone-in-mon-state-to-open-this-month-2

Basic information, current and future trend, environmental and climate change impact and recommendations for special economic zone are summarized in following table.

Table 7 Industrial Zone and Environmental Impact

Element	Description
Current and Future Trend	Only small scale and labor intensive industries are currently running at Mawlamyine industrial estate and it is unlikely to develop quickly in the future due to some restraint such as bridge and location. In contrary, newly developed Kyauktan industrial park has been planned with the lesson learnt from Mawlamyine zone, this industrial estate would attract the local and foreign investment.
Environmental Impact	Industries currently running in this industrial zone are small and medium manufacturing facilities. The study has found that the industrial zone does not have a large impact on the surface and ground water contamination and has not significant degraded air quality or contributed significant emission leading to climate change. However, the villages located near the Mawlamyine industrial zone are affected by pollution especially by some rubber enterprise which causes air pollution and odor. Moreover, new industrial park is closely located to the Thanlwin River and a village called Kyauktan. River water pollution and unwanted social effect on the nearby village are anticipated. With increased production and manufacturing facility infrastructures in the future, the lack of regulation and management procedure could result in increasing ground and surface water quality degradation. Although industrial zone does not store large quantity of explosive substances and hazardous chemical, storage of fuel and other flammable materials should be carefully designed and constructed setting safety distance from nearest combustible material storage and residential area.
Climate Change and Linkage Impact	Based on the type of factories operating and likely operating in the future, the emission of global warming gases such as CO2 and CH4 releasing into atmosphere is minimal and negligible. Thus, it is anticipated that operation of the zone will not much contribute to global climate change itself.

Element	Description
	With respect to contribution to surrounding residents and communities, the type of industries in the zone is labor-intensive employing a number of local people. Generating regular income for those of employees working for factories enhances the livelihood security of communities.
Recommendation	It was noticed that industrial zone does not prepare emergency planning and response. To avoid or minimize any harm to nearest residents and workers, emergency management plan should be set up which will cover all industrial types in the event of fire and explosion. In order to minimize the environmental impact, following recommendations are proposed. • Development of a comprehensive waste collection and management system including industrial solid waste management regulation • Paying attention to safe and proper disposal and storage of hazardous and toxic materials. • Comprehensive risk assessment for community and occupational health and safety • Improve fire safety management • Provision of public water network instead of extracting ground water for utility purpose • Centralized industrial effluent treatment system • Well designed drainage system with silt trap

3.5.4 *Environmental Impact by Waste Management*

Like other cities in Myanmar, waste management is also a growing issue in Mawlamyine. There are challenges in all waste management processes such as collection, transportation, segregation and disposal.

With available budget, capacity, resource and equipment, City Development Committee which is responsible for day to day waste handling and disposal , has been encountering a great deal of challenges.

Figure 14 Open Burning at Muyoung Site

The designated waste damping facility, Muyoung, is located in Kyaukmayaw Township about 5 Km to the southeast of Mawlamyine town. The area occupies about 82 acres.

Despite the fact that site is for open dumping, due to the limited land availability, all mixed solid waste is burned at the site and ashes are buried.

Figure 15 Muyoung Final Disposal Site (Active)

Source: Adapted from Google Earth

In fact, this dumping site is totally unacceptable in term of social environmental and health aspects. There are no proper structures and facilities to prevent leaching of contaminants into the soil. The existing site is operating in a way that causes sanitary issues. No leaches control facility is available. No parameter boundary or fenced is installed to prevent unauthorized person and animal entering into the dumping site.

It is estimated that in 2015, total waste generation in township is 170.8 tpd while collected waste by Development Committee is about 60.89 tpd. That means only 35.6 % of solid wastes are transported and disposed of at burning site.

Basic information, current and future trend of waste generation, environmental and climate change linkage impact and recommendation are briefly described in the following table.

Table 8 Waste Management and Environmental Impact

Element	Description
Current and Future Trend	With growing population and potential booming of business and tourism, waste generation is likely to increase year by year. Projected waste generation in 2020 and 2030 are 212.8 tpd and 318.7 tpd respectively.[19]
Environmental Impact	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 Muyoung site is expected to include:

[19] Mawlamyine 2022 Clean and Green, Solid Waste Management, GRET

	• Toxic gases, particulate emission, 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 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.
Climate Change 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. Considering climate change impact on infrastructure, the opening burning site is located, in rather high elevation. Thus flooding will not reach to the infrastructure of the site.
Recommendation	One of the basic principles for sustainable waste management practice is to review the waste as a resource and manage it properly. That means increased volume of waste can be considered potential resources for human consumption and utilization. In general, waste for potential resource could be utilized following options. • 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. [20] • Increase collaboration with local university for joint research work on waste management. ***Other Recommendation*** • Study area needs a solid waste management plan to address

[20] Wikipedia

	issues generated by waste collection and disposal. Setting up 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 Thanlwin River so as to avoid throwing debris into river. • Uncontrolled waste disposal in public area and reuse and recycling practices should be promoted through public environmental campaigns and with providing incentives • Setting objective and target for waste recovery and segregation • Burning practices should be reduced by increasing landfill method and compositing sites

3.5.5 *Environmental Impact by Instream Sand Mining*

Traditional instream sand mining has existed for decades in the region for road construction and building works. Sand mining and gravel extraction has become one of the major businesses for local economy due *to* high demand for construction work. It has been observed that sand mining activities in Thanlwin Rivers has been increasing to supply aggregate material for construction. Methods used in sand are mining works in Thanlwin River include manual and mechanical extraction with high pressure jet pumps however; there is not sufficient information and data available over the sand extraction .

General information, current and future trend, environmental and climate change impact and recommendations for instream sand mining are summarized in following table.

Table 9 Instream Sand Mining and Environmental Impact

Element	Description
Current and Future Trend	The demand for sand and gravel in the construction of infrastructure and buildings in Mawlamyine has continued to increase and demand is expected to be high in the future as political reform has moves toward free economy and increased investment in infrastructure. It should be acknowledged that this could contribute to a significant local economic opportunities
Environmental Impact	Extensive extraction of sand and gravel directly leads to serious degradation of rivers and its eco system. Excess instream mining makes the stream bed lower to some extent and in turn, its produces river bank erosion and sudden collapse. Sand mining also contributes to saline intrusion if river is close to estuaries and seas. Sea level rise and intensive sand mining works might be compounded to bring faster sea level intrusion in the future.

Element	Description
	Other environmental impact triggered by excessive sand mining include influence on changes in river channel and river morphology, loss of aquatic habitat that alter pattern of sediment deposit. Major impact to river morphology results in degradation of riparian habitat. Riparian zone is highly important for river ecosystems as it serves as buffer zone to prevent pollutants entering from urban runoff, controlling soil erosion and providing nutrient to riparian habitats. Damaging riparian zone during sand and gravel extraction can lead to reduction of stream bank stabilization and increasing bank erosion frequencies. The stability of stream beds depends on harmonized balance of stream flow, sediment load and channel formation. With destruction of stream beds, there might be other detrimental effects on availability of aquatic food, impacting on other systems. Instream mining could adversely cause the increase of turbidity in short term near the mine site which could temporary degrade the river water quality. According to local sources, sand and gravel mining activities in Thanlwin river and immediate areas are taking place in an uncontrolled and unethical way. Protection of river ecosystems, riparian zone and other factors has never been prioritized when it comes to instream sand and gravel mining. Specific site, tool, volume, timing used in sand extraction are not taken into account for such activities. For better river management, the township management committee is suggested to initiate close monitoring program ensuring sand mining is carried out in environmentally and socially accepted way and in accordance with existing rules and regulations. One of the factors to be considered is supportive work for the future river trainings work, systematic data collection of volume of permissible sand and actual production to be initiated. Briefly, excessive instream sand and gravel mining could lead to following impact on Thanlwin River morphology and river ecosystem in negative and destructive way. • Deepening river bed and river bed degradation • Damage to aquatic food chain and aquatic habitat • Loss of riparian zone and Lowering water table which protect river ecosystem which might impact to riparian

Element	Description
	habitat • Rapid bed degradation, river bank instability and river bank collapse • River water quality degradation and increase turbidity • Seawater intrusion which directly threaten the river ecosystem
Climate Change and Linkage Impact	One of river ecosystem impacts occurring and likely to increase is saline water in the Thanlwin River .This river is experiencing saline water intrusion from the Andaman Sea during dry season. This occurs normally in the dry season when river flow is limited and river water level is low. According to local people and river morphologists, saline intrusion in Thanlwin River reaches to Htone Aing Village .However; no documented study relevant to assessment of salinity intrusion is publically available. Combined effects in form of cumulative impacts such as riverbed lowering by excessive instream mining, water level decreasing due to less rain, and potential future damming in upstream of Thanlwin River could worsen and extend the saline intrusion into the river. Along with sea level rise; the saline intrusion is expected to continue to the upper stream by excessive sand mining.
Recommendation	Suggestions are made to ensure enough environmental protection efforts are established to preserve river morphology, ecosystem and riparian environment and prevent potential collapse of riverbank. ➢ Environmental effects and sensitivity of river ecosystem should be assessed by river ecologist and hydrologist prior to approval of mining, value of resources, the importance of social, culture and religious terms are also to be considered. ➢ An estimation of permissible volume of sand and gravel within defined areas would ensure the sustainability of ecosystem in Thanlwin River and other streams. Permission of sand mining should be. ➢ Granted based on annual replenishment capacity. ➢ Extent of areas and intensity of activities are to be considered in permissions. ➢ Establishment of continuous monitoring mechanism should be carried out by authorized persons from relevant government organization ➢ Assessment of salinity intrusion in Thanlwin River should be conducted in collaboration with international organization

Element	Description
	taking into consideration climate change impacts on sea level raise. ➢ In order to avoid adverse environmental affects, it is proposed to maintain river ecosystem and to meet the huge demand for sand and aggregate material in future, some suggestions are generally made in consideration of alternative location for sand mining including abandoned stream channels and inactive flood plains should be prioritized for sand mining than in the active channel and extraction from small stream should be avoided

3.6. Key Vulnerabilities of Communities and Ecosystem Services

A number of environmental impacts triggered by development programs and human activities are identified and assessed in previous chapter. Riverbank erosion and mangrove forest degradation are quite common environmental issues in the study area. Although there is no data available to judge the status of air pollution in the region, opening burning activity performing on a daily basis could have resulted in significant health issues to nearby residents. The most vulnerable communities to be affected by air pollution from dumping site are the villagers living near the burning sites and residents living in the Sport University situated to the west of burning site as per following figure.

Lowland and coastal communities in Mawlamyine Township have been frequently suffering seasonal flooding during the rainy season. This natural disaster is worsened by environmental degradation such as mangrove forest in the region. Compounded effects of a number of development plan and human activities has also led the situation to be more vulnerable. Villages located in fluvial island, low land and riverbank encounters seasonal flooding during monsoon season.

Figure 16. Potential Residents affected by Air Pollution

Source: Adapted from Google Earth

3.6.1 *Health*

A significant number of health related issues could be trigged due to contaminant air pollutants by inadequate waste burning practices from municipal waste burning site and other activities.

Open burning of household waste, waste from business activities and other communal waste which contain 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 cancer and affect immune and reproductive systems.[21] 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.[22] Burning polystyrene releases Carbon Monoxide and styrene monomers into the environment, which can be extremely hazardous to health.[23]

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. Most vulnerable communities who could be suffered health problems by open burning and dumping water is predicted to be residents living about 1000 m distance from the site. However, this is just estimation and people living outside of this boundary could also be affected by these

Throwing rubbish and discharging domestic, industrial 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.

3.6.2 *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.[24]

Ecosystem in Mawlamyine generally is divided into different categories such as forest, glass land, wetland, river and urban built-up. Each ecosystem has unique characteristics in regulation on natural hazard and service to human being. For

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

example forest ecosystem plays role in flood protection and soil loss prevention[25]. River ecosystem provides food, water, agricultural land and transportation for human being.

3.6.3 *Food*

Rice is staple food of the people of Mawlamyine Township. Paddy rice field can be observed in rainy season. Apart from paddy field, some seasonal and cash crop such as varieties of beans, ground nut, lady finger, water melon, papaya, onion cucumber ,gourd, banana and other vegetables are grown on either on farmland, fluvial land, flood plain orchard or home garden. Like other area in Myanmar 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. Mawlamyine is famous for its tropical fruits. [26] Seasonal fruits such as Pomelo and Durian are grown in village-orchards.

Fish is another source of food for the region. Fish from rivers streams wetlands and fishponds are caught using traditional fishing techniques such as hook and line, cast net, trap to for household consumption and income generation.

However, flooding and water pollution could disrupt food security of the region. Contaminated water might poison aquatic fauna. Some degraded forest and shrub land have converted into commercial plantations such as rubber. These activities increase the attenuation of food availability from forest ecosystem to local residents.

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

3.6.4 *Water Availability and Quality*

Conventional dug water wells have been used for decades for drinking, cooking and watering domestic animals. Mawlamyine City Development Committee (MCDC) provided some households utility use through river water pumping and reservoirs. Major water sources for utility water are Kim Pon Chon Dam, Shwe Nat Taung Dam ,Attaran 1 and Attaran 2. Mawlamyine City Development Committee (MCDC) adopts sedimentation process utilization natural lagoon-type pond as sedimentation basin can be recognized. Other purification process is applied throughout the system. There is no chlorination process is applied to kill the microorganism. As a result, positive colonies of coliform are detected indicating the situation on safety of drinking water is threatened. [27]

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

[26] https://en.wikipedia.org/wiki/Mawlamyine#cite_note-am-3

[27] Myanmar Three Water Supply Development Project, Ministry of Health, Welfare and Labor of Japan, March 2013.

In the meantime, MCDC has vision to extend the new water source development. That is Attaran 3 project which aims at constructing of intake water facility at Attaran River.

3.6.5 *Key Vulnerable Community*

Key vulnerable communities who livelihood and resilience against climate extremes are likely to be affected by various environmental degradations are identified in the following table.

Table 10 Key Vulnerabilities by Environmental Impact

Activity	Impact	Effect on Human Being	Vulnerable Community
Air emission from burning site	Decreased air quality, production of particulate matter and air pollutant	Serious health issues	Children, old people and women living near the Muyoung burning site
Clearance of Mangrove Forest	Decreased natural barriers to flooding and other natural disaster	Acceleration of frequency and magnitude of flood	Community living near the coastal and fluvial island
Waste dumping	Drainage block, hygienic issue	Accelerate flood, spread of disease	Children, women and old people
Industrial Zone	Pollution	Decline of fish population due to water pollution	Fishermen

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 undertake to manage the environment and to reduce environmental risk. This implementation of these recommendations will increase the 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 lead to harmonization of environment, economy and social values of Mawlamyine 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

General Administration Department, city 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.

4.1.1 *Strengthening of institutional capacity*

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

4.2. 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. The waste management plan should be prepared 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. Improve capacity of government staff for inspection and monitoring of environmental performance of business activities
7. 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
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 Mawlamyine. 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.

Recommendations for Industry and Business

9. Improvement public participation and consultation in project development phase of new projects and activities
10. Initiate transparency and openness about project and business operations with publication of environmental, health and safety standards and policies.

11. 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
12. 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.)
13. Prioritize environmental conservation and pollution prevention mechanisms in business operations
14. Develop project specific environmental management framework with local government departments and implementation in accordance with existing EIA guidance and laws
15. 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
16. Initiate Corporate Social Responsibility programs focusing on enhancement of community resilience, protection of ecosystem service and environmental management
17. To establish an environmental management committee of industrial park with aiming at the improvement in environmental management of entire industrial area. Necessary environmental trainings should be given to them.

Recommendations for Community and Civil Society

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

Table 11 Generic Recommendation for Environmental Management

Sr.	Environmental Category	Recommendation	Benefit to Environment, Ecosystem Management , Climate Change Mitigation , Adaptation and Resilience
1. Human Settlement and Impact on Mangrove Ecosystem			
1A	Biological Environment	➢ Identification of mangrove forest area and monitoring the trend ➢ Protection of environmentally sensitive mangrove forest through existing legislative framework and public awareness ➢ Encourage reforestation and restoration in the disturbed area . ➢ Establish administrative capacity to oversee and manage the mangrove ➢ Promote public awareness the importance of mangrove forest ecosystem and linkage to natural disaster. ➢ Considering establishment of buffer zone between mangrove forest and residential area	• Conservation of mangrove ecosystem and improvement in natural barrier against disaster
2. Enhancement of tourism sector			
2A	General	➢ Tourism development should be regulated and overseen by local and national government departments and enforcement should be made by authorities concerned with existing environmental legislation	• Strengthening institutional framework
2B	Biological environment	➢ Expansion and upgrading of existing road and infrastructure facilities should be prioritized over planning new access roads and infrastructure ➢ Guidance materials including pamphlets/ signboards and posters should be produced for visitors to avoid any detrimental impact to flora and fauna	• Avoidance of destructive land acquisition and development activities • Enhancement of reputation of Mawlamyine tourism industry
2C	Landscape and aesthetic value	➢ Careful selection of location for new infrastructure such as accommodation and restaurant which should be responsible distance from sensitive area	• Maintaining ecosystem and aesthetic features

Sr.	Environmental Category	Recommendation	Benefit to Environment, Ecosystem Management , Climate Change Mitigation , Adaptation and Resilience
2D	Culture	➢ Restoration of historic building which have been left for year without proper restoration and renovation	• Increase the value of heritage and attract more tourist
2E	Water quality	➢ All hotels, inns, restaurants and other accommodations should be equipped with basic waste treatment facilities. ➢ Adequate waste collection points should be allocated in the tourist hotspots and waste collection systems including transportation to depot	• Controlling surface and ground water quality
2F	Livelihood	➢ Training to local people for employment in tourism sector such as area tourist guide, staff in hotel and restaurant business and environmental protection in the sector.	• Job creation, more income generation and improvement of resilience
3. Industrial Zone			
3A	General	➢ Development of a comprehensive waste collection and management system including industrial solid waste management regulation ➢ Paying attention to safe and proper disposal and storage of hazardous and toxic materials. ➢ Comprehensive risk assessment for community and occupational health and safety	• Strengthening institutional framework • Adequate waste management practice • Protection of water and soil degradation
3B	Water Quality	➢ Provision of public water network instead of extracting ground water for utility purpose ➢ Central or individual industrial waste water treatment facility ➢ Drainage should be constructed with silt trap	• Controlling the surface and ground water quality degradation

Sr.	Environmental Category	Recommendation	Benefit to Environment, Ecosystem Management , Climate Change Mitigation , Adaptation and Resilience
3C	Public Health and Safety	➢ Establish of industry zone emergency management plan ➢ Fire management and frequent inspection (internal and external) ➢ Provision of public water network instead of extracting ground water for utility purpose	• Reduce harm to residents • Avoidance of contamination, leakage and pollution
4. Waste Management			
4A	General	➢ Promote sustainable waste management awareness campaign to public ➢ Improvement of waste collection system through establishment of formal waste management process ➢ Handling the waste issue in more systematic and organized way might ameliorate the health of local people. ➢ City waste management plan including rural area should be reviewed and improved where deemed to be insufficient and an effective management and monitoring mechanism established	• Improve waste management infrastructure and environmental awareness • Reduce flooding and health risk • Improve waste management practice • Minimize health impact • Strengthening the cooperation of public in waste handling
4B	Ecological environment	➢ Compositing plants should be considered with technology and financial support from international aid agencies	• Improving infrastructure and protection of soil and water pollution • Improve use of organic fertile residue from compositing plants
4C	Landscape and aesthetic value	➢ Feasibility study of waste heat to energy and /or compost plants to minimize the area required for landfill	• Reducing land use and maintaining landscape feature
4D	Air quality	➢ Waste burning practices should be restricted	• Minimizing the emission of air pollutants

Sr.	Environmental Category	Recommendation	Benefit to Environment, Ecosystem Management , Climate Change Mitigation , Adaptation and Resilience
4E	River ecosystem and water quality	➢ Throwing all types of waste into river should be strictly controlled ➢ Provide sufficient waste collection bin along the river bank so as to avoid throwing debris into river ➢ Stick control to restaurants along the river bank to stop dumping waste into water body	• 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
4F	Public Health and Safety	➢ Uncontrolled waste disposal in public and other areas should be reduced through public awareness campaign	• Minimizing the contact between waste dumping site and public area to ensure the public health of community is secured
5. Instream sand mining			
5A	River ecosystems	➢ Abandoned stream channels and inactive flood plains should be prioritized for sand mining over active channel ➢ Extraction from small stream should be avoided. ➢ River ecosystem sensitivity should be determined with help of river ecologist and hydrologist ➢ Calculate the allowable volume of sand and gravel that would ensure the sustainability of the Thanlwin River and other stream ecosystems ➢ Permission for and mining should be based on annual replenishment levels, extent of proposed areas and intensity of activities, value of resources, the importance of social, culture and religious sites within proposed extraction areas ➢ Recommend sand and gravel extraction methods that would have least impacts on river morphology ➢ Establishment of continuous monitoring mechanism and	• Preservation of Thanlwin river ecosystem and river morphology • Improve the methodology and data collection practice of relevant department • Improvement in implementation of administrative procedures • Improve Institutional framework • Better information management and data inventory • Avoidance of reaching sand deficient river

		monitoring should be carried out by authorized persons appointed relevant bodies ➢ Implementation the guidance for sand mining in Kayin and Mon State to avoid detrimental environmental impact and damage to river ecosystem and morphology ➢ Assessment of salinity intrusion in Thanlwin River should be conducted in collaboration with international organizations	
6. Climate Change and Ecosystem Management			
6A	General	➢ Promote environmental awareness campaign in community highlighting the importance of ecosystem services and its relation to community resilience and climate change ➢ Review both Community Resilience Assessment Reports produced under BRACED to identify climate change and disaster shocks and stresses and further impacts caused by ongoing development activities ➢ Enhance the resilience of most vulnerable communities of Mawlamyine. through maintenance and improvement of the good ecosystem service of natural biodiversity by channeling small grants and funds to joint community and government environment and ecosystem management projects	• Improve ecosystem service Improve community resilience

အခြေခံ ပတ်ဝန်းကျင်ဆိုင်ရာစီမံခန့်ခွဲမှုနှင့် အကြံပေးချက်များ

ဤကဏ္ဍတွင် မော်လမြိုင် မြို့နယ်၏ အစိုးရအာဏာပိုင်များအနေဖြင့် ပတ်ဝန်းကျင်အားစီမံခန့်ခွဲမှုပြုလုပ်ခြင်းအားဖြင့် ပတ်ဝန်းကျင်ဆိုင်ရာ ဘေးအန္တရာယ်များကို လျော့ချနိုင်ရန်အတွက် အကြံပြုမှုများ နှင့် အစီအမံများကို ဆွေးနွေးတင်ပြထားပါသည်။

အစီရင်ခံစာအတွင်း ဖော်ပြထားသော အကြံပေးချက်များကို ပတ်ဝန်းကျင် ကာကွယ်ရေးလုပ်ငန်း၊ အသက်မွေးဝမ်းကျောင်း လုပ်ငန်းများကို ထိန်းသိမ်းခြင်းအပြင် ဒေသခံလူထု၏ ဘေးဒဏ်ခံနိုင်စွမ်းကို တည်ဆောက်ပေးခြင်း တို့တွင် ထည့်သွင်း စဉ်းစားနိုင်ပါသည်။

ဤပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းအစီရင်ခံစာ ပြုစုရာတွင် လေ့လာရေးအဖွဲ့သည် မော်လမြိုင် ဒေသ၏ သဘာဝ ပတ်ဝန်းကျင်ဆိုင်ရာ၊ စီးပွားရေး နှင့် လူမှုရေး ဆိုင်ရာ တန်ဖိုးများကို ညီညွတ်မျှတစွာ စဉ်းစားနိုင်စေရေး အတွက် လိုအပ်သော လုပ်ဆောင်ချက်များကို အထူး အလေးထား စဉ်းစားထားပါသည်။ ဒေသအတွင်းရှိ ရှိရင်းစွဲစက်ရုံများနှင့် ဖွံ့ဖြိုးရေး စီမံကိန်းများ စီမံချက်များသည် ပတ်ဝန်းကျင်ထိခိုက်မှုများ ဖြစ်နိုင်ခြေရှိသည်ဟု ယူဆကာ ထို စီမံကိန်းများနှင့် အခြားစီမံချက်များကို ဗဟိုပြု၍ ဤအကြံပေးချက်များ တင်ပြထားပါသည်။ လုပ်ငန်းများ အကောင်အထည်ဖော်ရာတွင် တာဝန်ရှိသည့် အဖွဲ့အစည်းများနှင့် တာဝန်ရှိမှုများကို လည်း ရှိတ်ဆက်တင်ပြထားပါသည်။ သို့သော်လည်း အကြံပြုချက် အားလုံးသည် ချက်ခြင်း အကောင်အထည်ဖော်ရန် မဖြစ်နိုင်ပါ။ ထို့ကြောင့် အသေးစိတ် အကောင်အထည် ဖော်ဆောင်ရွက်မည့် အစီအစဉ်ကို မြို့နယ်၏ ဆွေးနွေးတိုင်ပင်ရေး လုပ်ငန်းစဉ်အတွင်း ထည့်သွင်းစဉ်းစားရန် ရည်ရွယ် ထားပါသည်။

အဆိုပြုထားသော ဒေသဆိုင်ရာစီမံခန့်ခွဲမှုအစီအမံများကို လက်ရှိလုပ်ငန်းများ နှင့် ဖွံ့ဖြိုးရေးဆိုင်ရာ မူဝါဒများ နှင့် စီမံကိန်းများအစပြုရေးဆွဲရာ အဆင့်များတွင် ထည့်သွင်းစဉ်းစားရန်မှာ ဒေသဆိုင်ရာ အစိုးရ၏ တာဝန်ဖြစ်ပါသည်။ ထို့အပြင် မည်သည့်လုပ်ငန်းမဆို လုပ်ငန်းများမပြုလုပ်မီတွင် ဒေသခံအစိုးရ နှင့် လုပ်ငန်းနှင့်သက်ဆိုင်သူများ ဆွေးနွေးညှိနှိုင်းခြင်းသည် ရေရှည်ဖွံ့ဖြိုးတိုးတက်မှုအတွက် အဓိကကျသော အချက်တစ်ချက်ဖြစ်ပါသည်။ ထို့ကြောင့် ဆွေးနွေးညှိနှိုင်းခြင်းများကို စီမံချက် (သို့) စီမံကိန်းအဆင့်လုပ်ငန်းတိုင်းတွင် ပြုလုပ်ပေးရန်အကြံပြုပြီး သတင်းအချက်အလက်များ အပြည့်အစုံထုတ်ပြန်ကြေညာမှုအား ပြုလုပ်ရန်လည်း တိုက်တွန်းပါသည်။

ဤအစီရင်ခံစာသည် အစိုးရဌာနများ အနေဖြင့် လက်ရှိလုပ်ငန်းများအတွင်း ပတ်ဝန်းကျင်ဆိုင်ရာ စဉ်းစားရမည့် အချက်များကို ထည့်သွင်းနိုင်စေရန် အကြံပေး လမ်းညွှန်ချက်များသာဖြစ်ပြီး တာဝန်ခွဲဝေမှုနှင့် တာဝန်ယူမှု အပိုင်းများကို ထည့်သွင်းထားခြင်းမပြုထားပါ။

အဖွဲ့အစည်းများ၏ စီစဉ်ကွပ်ကဲမှု

ဒေသအတွင်းရှိ ကဏ္ဍအလိုက်လုပ်ငန်းများ၊ ဖွံ့ဖြိုးရေးစီမံကိန်းများ ပတ်ဝန်းကျင်နှင့်လူမှုရေး စံနှုန်းများ၊ ကျင့်ဝတ်များနှင့်အညီပြဌာန်းထားသော ဥပဒေများနှင့်အညီ လုပ်ကိုင်ဆောင်ရွက်ရန်အတွက် အထွေထွေ အုပ်ချုပ်ရေးဦးစီးဌာန၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန နှင့် အခြားသက်ဆိုင်ရာ ဌာနများတွင်တာဝန်ရှိပါသည်။ ဒေသအတွင်းရှိ စက်မှုဇုံများ နှင့် အခြားလုပ်ငန်းများ ကြောင့် ဖြစ်ပေါ်လာနိုင်သော ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ဆိုးကျိုးသက်ရောက်မှုများကို ယခင်က စဉ်းစားထားခြင်း စနစ်တကျ ပြုလုပ်ထားခဲ့ခြင်း မရှိပါ။ ဌာနဆိုင်ရာများအတွင်းနှင့် ပုဂ္ဂလိကများအတွင်း ပတ်ဝန်းကျင် ကိစ္စများနှင့်ပတ်သတ်၍ ပူးပေါင်းဆောင်ရွက်မှု အတန်ငယ် အားနည်း နေဆဲဖြစ်ပါသည်။ ထို့အပြင် ဤကိစ္စများကို စောင့်ကြပ်ရန် မူဘောင်မှာလည်း အားနည်းနေပါသည်။

အဖွဲ့အစည်းများ၏ စွမ်းဆောင်ရည်များ မြှင့်တင်ပေးခြင်း

လက်ရှိစွမ်းရည်များကို အခြေခံ၍အကဲဖြတ်ရာတွင် မြို့နယ်၊ ခရိုင်၊ တိုင်းဒေသကြီး၊ ပြည်နယ် နှင့် အဓိက ဗဟို အစိုးရအဖွဲ့အစည်းများတွင် ပတ်ဝန်းကျင်နှင့် သက်ဆိုင်သော အခန်းကဏ္ဍသည် ၎င်းတို့၏အစိုးရဝန်ထမ်းများအတွက် နယ်ပယ်အသစ်တစ်ခုဖြစ်နေပါသည်။ ထို့ကြောင့် တစ်ဦးချင်း နှင့် အဖွဲ့အစည်းတစ်ခုလုံး၏ စွမ်းရည်မြှင့်တင်ရန် ပိုမိုအားကောင်းသော ကြိုးပမ်းအားထုတ်မှုများလိုအပ်ပါသည်။ လုပ်ငန်းများ၏ ပတ်ဝန်းကျင်ဆိုင်ရာ ဆောင်ရွက်လုပ်ကိုင်မှုများကို စောင့်ကြပ်ရန်နှင့် ပတ်ဝန်းကျင်ဆိုင်ရာ စိုးရိမ်ပူပန်မှုများ ဖော်ထုတ်နိုင်ရန်အတွက် သက်ဆိုင်ရာဌာနများမှ ဝန်ထမ်းများကို ပတ်ဝန်းကျင်ဆိုင်ရာ လေ့လာစောင့်ကြည့်ရေးနှင့် ပတ်သတ်သော အရည်အသွေးဆိုင်ရာ သင်တန်းများနှင့် အခြားအရင်းအမြစ်များ ထောက်ပံ့ရန်လိုအပ်လျက်ရှိပါသည်။

အဖွဲ့အစည်း အသီးသီးမှ ဆောင်ရွက်သင့်သော အကြံပေးချက်များ

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

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 နားလည် လက်ခံရန် ၊ ဥပဒေစိုးမိုးမှုများကို လေ့လာစောင့်ကြည့်ရန် နှင့် ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ကိစ္စများကို လေ့လာစောင့်ကြပ်ရေး နည်းလမ်းများကို တည်ဆောက်နိုင်ရန်အတွက် မြို့နယ်နှင့် ပြည်နယ်ဒေသ အတွင်း ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အဖွဲ့အစည်း၊ ကော်မတီဖွဲ့စည်းရန်
3. ဂေဟစနစ်မှ ပေးသော ဝန်ဆောင်မှုများနှင့် ဒဏ်ခံနိုင်စွမ်းဆက်စပ်ပုံများကို အခြေခံသော ပတ်ဝန်းကျင်ဆိုင်ရာ အသိပညာပေး လုပ်ငန်းများကို ဒေသခံလူထုအတွင်း ဆောင်ရွက်သွားရန်
4. အမှိုက်သိမ်းဆည်းနည်းများ၊ အမှိုက်ပစ်နည်းများ နှင့် ရေရှည်ဖွံ့ဖြိုးတိုးတက်မှုကို ဦးတည်သော အမှိုက်များစီမံခန့်ခွဲမှု များနှင့် ပတ်သတ်သော အသိပညာပေး လုပ်ငန်းများ ပါဝင်သည့် မြို့နယ်ဆိုင်ရာ အမှိုက်စီမံခန့်ခွဲမှု စီမံချက်များ တည်ဆောက်နိုင်ရန်၊ ထိုသို့ရေးဆွဲရာတွင် အမျိုးသား စွန့်ပစ်အမှိုက် စီမံခန့်ခွဲရေး မဟာဗျူဟာနှင့် လိုက်လျောညီထွေ ဆောင်ရွက်သင့်ပါသည်။
5. ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဌာနနှင့်အခြားဆက်စပ်ဌာနများမှ ဝန်ထမ်းများကို ပတ်ဝန်းကျင်ဆိုင်ရာ ပြဋ္ဌာန်းချက်ဥပဒေများ လက်တွေ့အကောင်အထည်ဖော်ရေးဆိုင်ရာ အရည်အသွေးမြှင့်တင်မှုများ ပြုလုပ်ရန်
6. ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဌာနမှ ဝန်ထမ်းများကို စီးပွားရေးလုပ်ငန်းများ၏ ပတ်ဝန်းကျင်ဆိုင်ရာ အကောင်အထည်ဖော် ဆောင်ရွက်မှုများကို လေ့လာစောင့်ကြပ်မှုနှင့်ပတ်သတ်သော အရည်အသွေး ဆိုင်ရာသင်တန်းများ ပို့ချပေးခြင်းများ ပြုလုပ်နိုင်ရန်
7. ဖွံ့ဖြိုးရေးလုပ်ငန်းများကြောင့် ပတ်ဝန်းကျင်နှင့် ဒေသခံလူထုတို့၏ ရာသီဥတုဆိုးဝါးမှု ဒဏ်ခံနိုင်စွမ်းကို မည်သို့မည်ပုံ သက်ရောက်မှုရှိနိုင်ကြောင်း ကုမ္ပဏီများ အဖွဲ့အစည်းများမှ ပွင့်လင်းစွာ တင်ပြနိုင်ရေးအတွက် တွန်းအားပေးရန်
8. မြို့နယ်အတွင်းရှိ ဌာနဆိုင်ရာများ အနေနှင့် ရာသီဥတုပြောင်းလဲမှုများ၊ ရာသီဥတု ပြောင်းလဲမှုများကြောင့် ဖြစ်ပေါ်လာသော ဘေးနှင့်ဖိစီးမှုများ၊ လက်ရှိစီမံကိန်းများမှ နောင်တွင် ဖြစ်ပေါ်လာနိုင်သော ပတ်ဝန်းကျင်ဆိုးကျိုးသက်ရောက်မှုများကို ဖော်ထုတ်နိုင်ရန်အတွက် BRACED စီမံကိန်းမှ ပြုစုခဲ့သော ဗျူဟာမြောက် ပတ်ဝန်းကျင်ဆိုင်ရာ ဆန်းစစ်ခြင်းနှင့် ကျေးရွာလူထု၏ ဘေးအန္တရာယ်ဒဏ် ခံနိုင်စွမ်း စစ်တမ်းများကို လေ့လာ သုံးသပ်ရန်။(မော်လမြိုင်ဒေသအတွင်းရှိ အင်အားအနည်းပါးဆုံး ဒေသခံတို့၏ ဘေးဒဏ်ခံနိုင်စွမ်း

မြင့်မား လာစေရေးအတွက် ဒေသခံတို့မှာ ရှာဖွေ ဖော်ထုတ်ထားသော လုပ်ဆောင်ရမည့် လုပ်ငန်းများ အားလုံးကို အတူတကွ ပေါင်းစည်း၍ ပိုမိုကျယ်ပြန့်သော စီမံချက်များ ရေးဆွဲသင့်ပါသည်။ ထိုသို့ပြုလုပ်ရာတွင် အစိုးရနှင့် ပြည်သူတို့ အတူတကွ လုပ်ကိုင်နိုင်မည့် ပတ်ဝန်းကျင်နှင့် ဂေဟစနစ်ဆိုင်ရာ စီမံကိန်းများအတွက် အသေးစားရံပုံငွေများ ရရှိအောင်ဆောင်ရွက်ခြင်းဖြင့် ဇီဝမျိုးစုံမျိုးကွဲ၏ ဂေဟစနစ်ဆိုင်ရာ ဝန်ဆောင်မှုများ မြင့်တက်လာနိုင်သည်" ဆိုသော အချက်ကိုလည်း ထည့်သွင်းနိုင်ပါသည်)

စက်ရုံအလုပ်ရုံများ နှင့် စီးပွားရေးလုပ်ငန်းများ

9. စီမံကိန်းနှင့် စီးပွားရေးလုပ်ငန်းများ၏ ပတ်ဝန်းကျင် ၊ကျန်းမာရေးနှင့် လုပ်ငန်းခွင်ဆိုင်ရာ ဘေးအန္တရာယ်ကင်းရှင်ရေး ဆိုင်ရာ မူဝါဒများ၊ စံနှုန်းများကို တရားဝင်ထုတ်ပြန်ခြင်းဖြင့် ပွင်းလင်းမြင်သာမှုများကို ဖော်ဆောင်ရန်
10. ရပ်ရွာလူထု ဝန်ဆောင်မှုလုပ်ငန်းများ နှင့် စနစ်များ(အစားအသောက်၊ရေ၊စွမ်းအင်နှင့်ကျန်းမာရေး)၊ ရပ်ရွာလူထု၏ အစွန်းရောက် ရာသီဥတုများ၊ ပတ်ဝန်းကျင် ဆိုးကျိုးများအပေါ် ဒဏ်ခံနိုင်ရည်စွမ်းကို မည်သို့သက်ရောက်နိုင်သည် ဆိုသော တွေ့ရှိချက်များကို ဂေမျှဖြန့်ဖြူးရန်၊ ဆိုးကျိုးများကို လျော့ပါးစေသော အစီအမံများ ဆောင်ရွက်ရန်
11. ဖွံ့ဖြိုးရေးစီမံကိန်းများနှင့် စီးပွားရေးလုပ်ငန်းများသည် စီးပွားရေး တိုးတက်မှုနှင့် အကျိုးအမြတ် ရနိုင်မှုကို ဦးတည်သော ဘေးဒဏ်ခံနိုင်စွမ်း ဆိုင်ရာ လုပ်ငန်းများ ပါဝင်သည့် စီးပွားရေး ဆောင်ရွက်မှုများ ပိုမိုများပြားလာစေရန်အတွက် တွန်းအားပေးရန် (ဥပမာ- စိုက်ပျိုးရေးနှင့်သက်ဆိုင်သော လုပ်ငန်းများ၊ ရပ်ရွာလူထုအတွက် အခြေခံ အဆောက်အဦများ၊စွမ်းအင်နှင့် ရေ ဖြန့်ဖြူးရေး ဝန်ဆောင်မှု လုပ်ငန်းများ)
12. လုပ်ငန်းခွင်ဆိုင်ရာ ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးများနည်းတူ စီမံကိန်းအနီးတဝိုက်မှ ဒေသခံပြည်သူတို့၏ ကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေးအတွက်လည်း ဆောင်ရွက်ရန်
13. အခြား စီးပွားရေးဆိုင်ရာ လုပ်ငန်းများနှင့်အတူ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနှင့် ပတ်ဝန်းကျင်ညစ်ညမ်းမှုများ ကာကွယ်ရေး တို့သည်လည်း အရေးကြီးကြောင်း သတ်မှတ်ထားနိုင်ရန်
14. တည်ဆဲ EIA လုပ်ထုံးလုပ်နည်း နှင့်အညီ စီမံကိန်းနှင့်ဆိုင်သော ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံချက်များကို ရေးဆွဲအကောင်အထည်ဖော်ရန်
15. စီးပွားရေးနှင့် ဖွံ့ဖြိုးရေးလုပ်ငန်း များကြောင့် ပတ်ဝန်းကျင်ဆိုးကျိုးနှင့် ဒေသခံတို့၏ အစွန်းရောက် ရာသီဥတုဒဏ်ခံစွမ်းရည်များကို မထိခိုက်စေရန်အတွက် မိမိတို့၏ လုပ်သားထုများကို ပတ်ဝန်းကျင်ဆိုင်ရာ သင်တန်းများပေးရန်အတွက် အစီအစဉ်များ ရေးဆွဲရန်
16. ဒေသခံတို့၏ ရာသီဥတုဒဏ်ခံနိုင်စွမ်းရည် မြင့်တက်လာစေရန် ၊ ဂေဟစနစ်မှပေးသော ဝန်ဆောင်မှုများကို ထိန်းသိမ်းရန် နှင့် ပတ်ဝန်းကျင်ဆိုင်ရာစီမံချက်များ ပါဝင်သော လူမှုတာဝန်သိမှု အစီအစဉ်များရေးဆွဲ အကောင်အထည်ဖော်ရန်
17. စက်မှုဇုံသစ်တွင် ပတ်ဝန်းကျင်ဆိုင်ရာ ကော်မီတီငယ် ဖွဲ့စည်းပြီး ထိရောက်သောပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှုများ ပြုလုပ်နိုင်ရန် ၊ ထိုအဖွဲ့အတွက်လည်း လိုအပ်သော သင်တန်းများ ပေးနိုင်ရန်

အရပ်ဖက်အဖွဲ့အစည်းနှင့်ဒေသခံလူထု

18. သက်ဆိုင်ဆက်စပ်သူများ အစည်းအဝေးများတွင် ပါဝင်ဆွေးနွေးကြရန်။ မိမိတို့အစဉ်အဆက် တွေ့ကြုံခဲ့ရသော အဖြစ်အပျက်များ ဗဟုသုတများကို ထိုသို့သော ဆွေးနွေးပွဲများတွင် အတွေ့အကြုံဖလှယ်ခြင်း၊ စိတ်ပူပန်သောအကြောင်းများနှင့် ဖြစ်ပေါ်နိုင်သော စိမ်ခေါ်မှုများကို တင်ပြနိုင်ရန်
19. အစိုးရနှင့်အခြားအဖွဲ့အစည်းများမှ ဦးဆောင်ကျင်းပသော အပြုသဘောဆောင်သည့် ပတ်ဝန်းကျင် ဆိုင်ရာ ထိန်းသိမ်းရေး ပညာပေးရေး လုပ်ရှားမှုများတွင်တက်ကြွစွာပါဝင်ရန်

20. စီမံကိန်းအသစ်များ၏ ဥပဒေ ၊လုပ်ထုံးလုပ်နည်းများ နှင့်အညီ ဆောင်ရွက်ခြင်း ရှိမရှိ သိရှိ ရန်အတွက် ပုဂ္ဂလိက လုပ်ငန်းများ စောင့်ကြည့်ရေးလုပ်ငန်းစဉ် ထူထောင်ရန်
21. စီးပွားရေးနှင့် အခြားဖွံ့ဖြိုးတိုးတက်ရေးလုပ်ငန်းများ၏ တာဝန်ယူမှုနှင့် တာဝန်ခံမှုများ တိုးတက်လာစေရန် လုပ်ငန်းများ၏ ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံဆောင်ရွက်မှုများကို လေ့လာစောင့်ကြည့်ရန်

အခြေခံ အကြံပြုချက်များ ဇယား

စဉ်	လုပ်ငန်း (သို့) စီမံကိန်းပုံစံ	အကြံပြုချက်	ရာသီဥတုပြောင်းလဲမှု ဖြေလျှော့ခြင်း၊ လိုက်လျောညီထွေဆောင်ရွက်ခြင်း နှင့် ခံနိုင်ရည်ရှိခြင်း ဆိုင်ရာ အကျိုးကျေးဇူးများ
၁. လူတို့အခြေချနေထိုင်ခြင်းနှင့် ဒီရေတောစနစ်			
၁(က)	ဇီဝပတ်ဝန်းကျင်	• ဒီရေတောများတည်နေရာများကို သတ်မှတ်ခြင်းနှင့် လားရာကို သိရှိနားလည်ခြင်း • တန်ဖိုးရှိပြီးရှားပါးစာရင်းဝင်နေသာ ဒီရေတောများအား တည်ဆဲဥပဒေများဖြင့် အကာအကွယ်ပေးခြင်း • ပျက်စီးသွားသော ဒီရေတောများကို ပြန်လည်စိုက်ပျိုးခြင်းနှင့်ထိန်းသိမ်းခြင်း • ဒီရေတောများထိန်းသိမ်းရန်အတွက် အုပ်ချုပ်မှုစွမ်းရည်မြှင့်တင်ခြင်း • ဒီရေတောများ၏ အရေးပါမှုနှင့် ရာသီဥတုပြောင်းလဲခြင်းနှင့်ဆက်စပ်မှုများကို ပြည်သူလူထု ယခုထက်ပိုရှိနားလည်စေရန်အတွက် ပညာပေးလုပ်ရှားမှုများပြုလုပ်ခြင်း • ဒီရေတောများနှင့် လူတို့နေထိုင်ရာနေရာများကို ကြားခံနယ်မြေများတည်ဆောက်ပေးနိုင်ရန် စဉ်းစားခြင်း	ဒီရေတောများ ထိန်းသိမ်းခြင်းနှင့် သဘာဝ ဘေးအန္တရာယ်တားဆီးမှုများ အားကောင်းလာခြင်း
၂.ခရီးသွားလုပ်ငန်းမြှင့်မားလာခြင်း			
၂(က)	အထွေထွေ	• လက်ရှိ ပတ်ဝန်းကျင်ဆိုင်ရာ ဥပဒေများအသက်ဝင်ရေး နှင့် လိုအပ်သော ဥပဒေများ ပိုမို ပေါ်ထွန်းလာရေးအတွက် သက်ဆိုင်သော အစိုးရအဖွဲ့အစည်းများမှ တွန်းအားပေးမှုများပြုလုပ်ပေးခြင်း	အဖွဲ့အစည်းဆိုင်ရာ ပူးပေါင်းဆောင်ရွက်မှု မူဘောင်အား အားကောင်းစေခြင်း
၂(ခ)	ဂေဟစနစ်ပတ်ဝန်းကျင်	• လမ်းအသစ်များ ထပ်မံဖောက်လုပ်ခြင်းထက် ရှိပြီးသား လမ်းများအား ချဲ့ထွင်ခြင်းနှင့် အဆင့်မြှင့်တင်ခြင်းကို ဦးစားပေးဆောင်ရွက်ခြင်း • အပင် နှင့် တိရစ္ဆာန်များ အား ဆိုးရွားသော သက်ရောက်မှုများ မဖြစ်စေရေးအတွက် ခရီးသွားများအတွက် လမ်းညွှန်ချက်များထုတ်ဝေခြင်း	မလိုလားအပ်သော မြေယာသိမ်းဆည်းမှုများကို ရှောင်ရှားနိုင်ခြင်း မော်လမြိုင်ဒေသ၏ ခရီးသွားလုပ်ငန်းအား ဂုဏ်တက်စေခြင်း
၂(ဂ)	မြေယာရှုခင်းသဘာ	• အဆောက်အဦအသစ်များတည်ဆောက်ခြင်းအတွက် တည်နေရာများကို ဂရုတစိုက်ရွေးချယ်ပေးခြင်း ဥပမာ- စားသောက်ဆိုင်များနှင့်	ဂေဟစနစ်နှင့် လှုပသော သဘာဝပတ်ဝန်းကျင် သွင်ပြင်လက္ခဏာများကို

စဉ်	လုပ်ငန်း (သို့) စီမံကိန်းပုံစံ	အကြံပြုချက်	ရာသီဥတုပြောင်းလဲမှု ဖြေလျှော့ခြင်း၊ လိုက်လျောညီထွေဆောင်ရွက်ခြင်း နှင့် ခံနိုင်ရည်ရှိခြင်း ဆိုင်ရာ အကျိုးကျေးဇူးများ
	၀အလှအပ	လူနေအဆောက်အဦးများကို ထိခိုက်လွယ်သော နေရာများမှ သင့်တော်သော အကွာအဝေး တွင်ထားရှိခြင်း။	ထိန်းသိမ်းခြင်း။
၂(ဃ)	ရေထုအရည်အသွေး	• ဟိုတယ်၊ တည်းခိုခန်းများနှင့် စားသောက်ဆိုင်များနှင့် မိလ္လာကန်ကဲ့သို့သော အခြေခံအဆောက်အကြေး စီမံခန့်ခွဲမှု စနစ်တပ်ဆင်ထားသော အခြား အခြေခံ နေထိုင်ခြင်းများ။ • ခရီးသွားများ သွားလာရာ နေရာများတွင် အမှိုက်ပုံးများ လုံလောက်စွာ ထားရှိပေးခြင်းနှင့် အမှိုက်သိမ်းသည့် နေရာသို့ သယ်ယူပို့ဆောင်ရေးစနစ်တို့ကို ဆောင်ရွက်ခြင်း	မြေပေါ် ရေနှင့် မြေအောက်ရေ အရည်အသွေး ကျဆင်းလာမှုကို ထိန်းချုပ်နိုင်ခြင်း
၂(c)	သက်မွေး၀မ်းကြောင်း	• ဒေသခံများအလုပ်အကိုင် အခွင့်အရေးပိုမို ရရှိလာရေးအတွက် ဒေသခံ ဧည့်လမ်းညွှန် သင်တန်းများ၊ စားသောက်ဆိုင်နှင့် ဟိုတယ်၀န်ဆောင်မှုသင်တန်းများ ဦးစားပေးခြင်း	ဒေသခံများ ၀င်ငွေတိုးတက်မှုမှတဆင့် ဘေးဒဏ်ခံနိုင်စွမ်းများ မြင့်တက်ခြင်း အလုပ်အကိုင်အခွင့်အရေးများ များပြားလာခြင်း
၃.စက်မှုဇုံ			
၃(က)	အထွေထွေ	• စွန့်ပစ်အမှိုက်များအပါအ၀င် စက်ရုံများမှထွက်လာသော အမှိုက်များ စီမံခန့်ခွဲမှုစနစ်တခုကို စက်မှုဇုံအတွက်သီးသန့်ရေးဆွဲခြင်း • ဒေသခံနှင့် လုပ်ငန်းခွင်ဆိုင်ရာ ဘေးအန္တရာယ် ကင်းရှင်းရေးအတွက် အန္တရာယ်ဖြစ်နိုင်ခြေ စစ်တမ်း ဆောင်ရွက်ခြင်း	အဖွဲ့အစည်းဆိုင်ရာ ပူးပေါင်းဆောင်ရွက်မှု အားကောင်းစေခြင်း လုံလောက်သော စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု အလေ့အကျင့်ရှိစေခြင်း ရေ နှင့် မြေဆီလွှာ အရည်အသွေး လျော့ကျမှုမှ ကာကွယ်ခြင်း
၃(ခ)	ရေထုအရည်အသွေး	• ပိုက်လိုင်းများမှတစ်ဆင့်ရေ ပေးဝေခြင်းများဆောင် ရွက်ခြင်းဖြင့် မြေအောက်ရေသုံးစွဲမှု လျော့ကျလာကာ မြေအောက်ရေ	မြေပေါ် မြေအောက်ရေ အရည်အသွေးထိန်းချုပ်နိုင်ခြင်း

စဉ်	လုပ်ငန်း (သို့) စီမံကိန်းပုံစံ	အကြံပြုချက်	ရာသီဥတုပြောင်းလဲမှု ဖြေလျော့ခြင်း၊ လိုက်လျောညီထွေဆောင်ရွက်ခြင်း နှင့် ခံနိုင်ရည်ရှိခြင်း ဆိုင်ရာ အကျိုးကျေးဇူးများ
		ပမာဏနှင့်အရည်အသွေးထိန်းသိမ်းခြင်း • စက်မှုဇုံ ဗဟိုစနစ် သို့မဟုတ် စက်ရုံတစ်ခုခြင်းစီ စွန့်ပစ်ရေ သန့်စင်ရေးစက်ရုံ တည်ဆောက်ခြင်း • ရေနုတ်မြောင်းများအတွင်း နုန်းတားကျင်းများ ထည့်သွင်းစဉ်းစားခြင်း	
၃(ဂ)	လူထုကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေး	• စက်မှုဇုံဆိုင်ရာ အရေးပေါ်အခြအနေ စီမံချက် ရေးဆွဲထားသင့်ပါသည် • မီဘေးအန္တရယ်နှင့်ပတ်သတ်၍ ပိုမိုတင်းကြပ်သော စည်းမျဉ်းစည်းကမ်းများ၊ စစ်ဆေးမှုများ ပြုလုပ်သင့်ပါသည်။(စက်ရုံတွင်းနှင့် အခြားအဖွဲ့အစည်း)	ဒေသခံများအပေါ် အန္တရာယ်ကျရောက်မှု လျော့ပါးခြင်း၊ညစ်ညမ်းစေသောအရာများ နည်းပါးခြင်း
၄. စွန့်ပစ်အမှိုက်များစီမံခန့်ခွဲမှု			
၄(က)	အထွေထွေ	• ရှေ့ရှည်တည်တံ့မှု ဖွံ့ဖြိုးမှုတို့ကို ဦးတည်သောရည်ရွယ်ချက်ဖြင့် ပြည်သူတို့၏ အမှိုက်သိမ်းဆည်း၊စွန့်ပစ်နေမှုများနှင့်ပတ်သတ်၍ အသိပညာမြင့်မားရေး လုံ့ဆော်မှုများ ပြုလုပ်သင့်ပါသည် • ထိရောက်သော စီမံခန့်ခွဲမှု နှင့် စောင့်ကြည့် စစ်ဆေးမှုရှိစေရန် ထားရှိနိုင်ခြင်းမှ တဆင့် ဒေသပြည်သူတို့အတွက် ရောဂါဘယများလျော့နည်းအောင် အထောက်အကူဖြစ် စေနိုင်ပါသည်။ • မြို့နှင့်ကျေးရွာများအလိုက် စွန့်ပစ်အမှိုက်များစီမံချက်များကို ပြန်လည် သုံးသပ်ရင်း ပိုမိုကောင်းမွန်သော စီမံချက်များရေးဆွဲအကောင်အထည်ဖော် သင့်ပါသည်	စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု ဆိုင်ရာ အဆောက်အဦများ တိုးတက်စေခြင်း ပတ်ဝန်းကျင်ဆိုင်ရာ အာရုံစိုက်မှုအား တိုးတက်စေခြင်း စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု အလေ့အကျင့်အား တိုးတက်စေခြင်း ကျန်းမာရေးထိခိုက်မှု လျော့ချခြင်း စွန့်ပစ်ပစ္စည်းဆိုင်ရာ ကိစ္စရပ်များကို ကိုင်တွယ်ရာတွင် လူထုပူးပေါင်းပါဝင်မှုအား ပိုမိုအားကောင်းလာစေခြင်း

စဉ်	လုပ်ငန်း (သို့) စီမံကိန်းပုံစံ	အကြံပြုချက်	ရာသီဥတုပြောင်းလဲမှု ဖြေလျော့ခြင်း၊ လိုက်လျောညီထွေဆောင်ရွက်ခြင်း နှင့် ခံနိုင်ရည်ရှိခြင်း ဆိုင်ရာ အကျိုးကျေးဇူးများ
၄(ခ)	ဂေဟစနစ်ပတ်ဝန်းကျင်	• နိုင်ငံတကာ အဖွဲ့အစည်းများ၏နည်းပညာ နှင့်အခြားအကူအညီများဖြင့် မြေဆွေးပြုလုပ်သော စီမံကိန်းများ တည်ဆောက်ရန်အတွက် စဉ်းစားခြင်း	မြေဆွေးများမှတဆင့် သဘာဝဓါတ်မြေဩဇာ အသုံးပြုမှု မြင့်တက်လာနိုင်ခြင်း အခြေခံအဆောက်အဦးများရှိမှုကို ပိုမိုများပြားလာစေခြင်း
၄(ဂ)	မြေယာရှုခင်းသဘာဝအလှအပ	• အမှိုက်မှတဆင့် လျှပ်စစ်စွမ်းအား ထုတ်နိုင်သောစီမံကိန်းများနှင့် သဘာဝမြေဆွေးထုတ်လုပ်သည့်စီမံကိန်းများ ဖြစ်နိုင်ခြေရှိမရှိလေ့လာခြင်း၊ တည်ဆောက်ခြင်းတို့ဖြင့် မြေနေရာကို လျော့ချနိုင်ခြင်း	မြေအသုံးချမှုနည်းပါးခြင်းနှင့် သဘာဝမြေယာရှုခင်းများ မပျက်စီးခြင်း
၄(ဃ)	လေထုအရည်အသွေး	• အမှိုက်ကိုတိုက်ရိုက် မီးရှို့သည့်စနစ်ကို အတတ်နိုင်ဆုံးလျော့ချခြင်း နှင့် နောက်ဆုံးအပြီးအပိုင်ရပ်စဲခြင်း	လေထုညစ်ညမ်းမှုကို လျော့ချနိုင်ခြင်း
၄(င)	ရေထုအရည်အသွေး နှင့်မြစ်ဂေဟစနစ်	• သံလွင်မြစ်အတွင်းသို့ မည်သည့်အမှိုက်အမျိုးအစားမဆို စွန့်ပစ်ခြင်းကို ထိရောက်စွာ တားဆီးရခြင်း • မြစ်အတွင်းသို့ အမှိုက်များစွန့်ပစ်ခြင်းကို ကာကွယ်ရန် သံလွင်မြစ်တလျောက်တွင် အမှိုက်ပုံများ လုံလောက်စွာ ထားရှိခြင်း • မြစ်ကမ်းနံဘေးတွင်ဖွင့်လှစ်ထားသော စားသောက်ဆိုင်များမှ မြစ်အတွင်း အမှိုက်များ စွန့်ပစ်ခြင်း မပြုရန် တင်းကျပ်သော စည်းကမ်းများ ရေးဆွဲခြင်း	မြစ်ရေ အရည်အသွေး ပိုမိုကောင်းမွန်လာပြီး၊ မြစ်အတွင်းရှိ ရေနေသတ္တဝါများ အပေါ် သက်ရောက်မှု လျော့ကျ လာမည် ဒေသခံ လူထု၏ အစားအစာ ရရှိနိုင်မှု တိုးမြင့်လာမည်
၄(စ)	လူထုကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေး	• လူထုပညာပေးလုပ်ရှားမှုများမှတဆင့် အများပြည်သူပိုင် နေရာများတွင် အမှိုက်ပစ်မှုများ နည်းပါးသွားအောင်လုပ်ခြင်း	လူများနေထိုင်ရာ နေရာ နှင့် စွန့်ပစ်ပစ္စည်း စွန့်ပစ်ရာနေရာများ ထိတွေ့မှုကို လျော့ချပြီး လူထု၏ ကျန်းမာရေး နှင့် ဘေးကင်း လုံခြုံမှုကို သေချာစေခြင်း
၄(ဆ)	ရေထုအရည်အသွေး နှင့်မြစ်ဂေဟစနစ်	• ကျင်းဟောင်းများအတွက် သင့်တော်သော ပိတ်သိမ်းသည့် အစီအစဉ်နှင့် ပြန်လည် ထူထောင်သည့် အစီအစဉ်	ရေအရည်အသွေးတိုးတက်လာပြီး စီမံခန့်ခွဲမှု စနစ် တိုးတက်လာခြင်း

စဉ်	လုပ်ငန်း (သို့) စီမံကိန်းပုံစံ	အကြံပြုချက်	ရာသီဥတုပြောင်းလဲမှု ဖြေလျော့ခြင်း၊ လိုက်လျောညီထွေဆောင်ရွက်ခြင်း နှင့် ခံနိုင်ရည်ရှိခြင်း ဆိုင်ရာ အကျိုးကျေးဇူးများ
		• စွန်ပစ်ရေ ထိန်းချုပ်မှုစနစ်နှင့် လက်ရှိ ပျက်စီးနေသော မြေနေရာများကို ပြန်လည်ကောင်းမွန်စေသော လုပ်ငန်းအစီအစဉ်များဆောင်ရွက်ခြင်း • ကျင်းဟောင်းနေရာများကို ပြန်လည်ကောင်းမွန်စေသော အစီအစဉ်	
၅. မြစ်အတွင်း သဲတူးဖော်ရေးလုပ်ငန်းများ			
၅(က)	မြစ်ကြောင်းဂေဟစနစ်	• အမြဲစီးဆင်းနေသော မြစ်ကြောင်း နှင့် သဲ သောင်များထက် စွန့်ပစ်ထားသော (သို့) ရေစီးဆင်းမှုနည်းသော မြစ်ကြောင်း နှင့် ရေလွှမ်းလွင်ပြင်များ ကို သဲတူးဖော်ရန်အတွက် ဦးစားပေးစဉ်းစားသင့်ခြင်း • မြစ်ချောင်းငယ်များမှ တူးဖော်ခြင်းကို ရှောင်ရှားသင့်ပါခြင်း • မြစ်ဂေဟစနစ်၏ ထိခိုက်လွယ်မှုကို သတ်မှတ်ခြင်းအားဖြင့် မြစ်ဆိုင်ရာ ဂေဟဗေဒပညာရှင် နှင့် ဇလဗေဒပညာရှင် များကို အထောက်အကူပြုခြင်း • သံလွင်မြစ် နှင့် အခြား မြစ်ချောင်းများ၏ ဂေဟစနစ်၏ ရေရှည်တည်တံ့မှုကို စဉ်းစားပြီး သတ်မှတ်ထားသော နေရာများအတွင်း ခွင့်ပြုနိုင်သော သဲ နှင့် ကျောက်စရစ် ပမာဏကို တွက်ချက်ခြင်း • နှစ်စဉ် ပြန်လည်ဖြည့်တင်းမှုကို အခြေခံသော တူးဖော်ခြင်းများကိုသာ ခွင့်ပြုပေးခြင်း • ဇရိယာများ တိုးချဲ့ခြင်း နှင့် လုပ်ငန်းလုပ်ကိုင်မှု အကြိမ်အရည်အတွက်အနည်းအများကို သေချာစဉ်းစားခြင်း • မြစ်၏ ရုပ်သွင်အပေါ်တွင် ထိခိုက်မှု အနည်းဆုံးဖြစ်သော သဲနှင့် ကျောက်စရစ် တူးဖော်ခြင်း နည်းလမ်းများကို အကြံပြုခြင်း • စဉ်ဆက်မပြတ် စောင့်ကြပ်လေ့လာခြင်း စနစ်တည်ဆောက်မှုနှင့် သင့်လျော်သော အဖွဲ့အစည်းများမှ အာဏာပိုင်များအနေဖြင့် စောင့်ကြည့်လေ့လာခြင်း • အရင်းအမြစ်များ၏ တန်ဖိုး၊ လူမှုရေး၊ ယဉ်ကျေးမှုနှင့် ဘာသာရေးဆိုင်ရာ အချက်အလက် များကို ထည့်သွင်းစဉ်းစားခြင်း • ဆိုးဝါးသောပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုနှင့် မြစ်၏ ဂေဟစနစ်နှင့် ရုပ်သွင်	• သံလွင်မြစ် ဂေဟစနစ် နှင့် မြစ်၏ ရုပ်သွင်ကို ထိန်းသိမ်းကာကွယ်ခြင်း • သက်ဆိုင်ရာဌာနများ၏ သုတေသနလုပ်ထုံးလုပ်နည်း နှင့် အချက်အလက်စုဆောင်းမှု အလေ့အကျင့်များကို တိုးတက်စေခြင်း • အဖွဲ့အစည်းဆိုင်ရာ ပူးပေါင်းဆောင်ရွက်မှုကို တိုးတက်စေခြင်း • အချက်အလက်ဆိုင်ရာ စီမံခန့်ခွဲမှု နှင့် စာရင်းသတ်မှတ်ထားရှိမှုကို တိုးတက်စေခြင်း

စဉ်	လုပ်ငန်း (သို့) စီမံကိန်းပုံစံ	အကြံပြုချက်	ရာသီဥတုပြောင်းလဲမှု ဖြေလျှော့ခြင်း၊ လိုက်လျောညီထွေဆောင်ရွက်ခြင်း နှင့် ခံနိုင်ရည်ရှိခြင်း ဆိုင်ရာ အကျိုးကျေးဇူးများ
		ကို ထိခိုက် ပျက်စီးစေနိုင်ခြင်း တို့ကို ရှောင်ရှားနိုင်ရန် ကရင်နှင့် မွန်ပြည်နယ်တို့တွင် သဲတူးဖော်ခြင်းလုပ်ငန်းအတွက် လမ်းညွှန်ချက်များကို လက်တွေ့အကောင်အထည်ဖော် ဆောင်ရွက်ထားခြင်း • သံလွင်မြစ်အတွင်းသို့ ဆားငန်ရေဝင်ရောက်မှုကို နိုင်ငံတကာအဖွဲ့အစည်းနှင့် ပူးပေါင်းပြီး လေ့လာ ဆန်းစစ်ခြင်း	
၆.ရာသီဥတုပြောင်းလဲမှုနှင့် ဂေဟစနစ်စီမံခန့်ခွဲမှု			
၆(က)	အထွေထွေ	• ဂေဟစနစ်မှ ပေးသော ဝန်ဆောင်မှုများ ၏ အရေးပါပုံ၊ငှင်းတို့ နှင့် ဒေသခံပြည်သူတို့၏ ဘေးဒဏ် ခံနိုင်စွမ်း ၊ရာသီဥတုပြောင်းလဲမှုများ ဆက်စပ်ပုံ များအကြောင်းကို အသိပညာပေး လှုပ်ရှားမှုများ ပြုလုပ်ကာ ဒေသခံပြည်သူများနားလည် သဘောပေါက်အောင် ဆောင်ရွက် သင့်ပါသည် • လက်ရှိစီမံကိန်းများ၊ စီမံချက်များ ၊ဝန်ဆောင်မှုလုပ်ငန်း များကြောင့် အနာဂါတ်တွင် ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ နှင့် ဒေသခံပြည်သူတို့ အပေါ်တွင် 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 အစုအဖွဲ့ဝင်ဒေသခံပြည်သူများ၏ ဘေးဒဏ်ခံနိုင်စွမ်းအားများ တိုးတက်လာနိုင်မည်ဖြစ်ပါသည်	ဂေဟစနစ် ဝန်ဆောင်မှုများ အားကောင်းလာခြင်း ဒသခံပြည်သူတို့၏ ဒဏ်ခံနိုင်စွမ်းများ မြင့်တက်လာခြင်း

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Appendix

Table 12 Recorded Fauna Species

Sr	Order Family	Scientific Name	Common Name	Remarks
1	Ardeidae	Ardea albus	Great Egret	LC
2	Ardeidae	Egretta grazetta	Little Egret	LC
3	Passeridae	Loncula Malacca	Black-Headed Munia	LC
4	Passeridae	Loncula Striata	White-Rumped Munia	LC
5	Passeridae	Passer monicrmus	Eurasian Tree Sparrow	LC
6	Passeridae	Passer hyperonthus	House Sparrow	LC
7	Passeridae	Ploceus hypornonthus	Asian Golden Weaver	LC
8	Irenidae	Irena puella	Asian Fairy Bluebird	LC
9	Muscucaoudae	Saxicala caprata	Pied Bushchat	LC
10	Ploceidae	Lonchua penchulata	Scaly-Breasted Munia	LC
11	Ploceidae	Ploceus philppenus	Bayan Weaver	LC
12	Stumidae	Acridotheres fuscus	Jungle Myna	LC
13	Stumidae	Acridotheres tristris	Common Myna	LC
14	Columbidae	Streptopelia chinensis	Spotted Dove	LC
15	Columbidae	Streptopelia orienlalis	Oriental Turtle Dove	LC
16	Columbidae	Cohemba livia	Rock Pigeon	LC
17	Pycnonotidae	Pycnonotus blanfordi	Streak Eared Buibul	LC
18	Sylviidae	Prinia hodgsonii	Grey-Breasted Prinia	LC
19	Nectariniidae	Dicoeum concolor	Plain Flowerspecker	LC
20	Pycnonotidae	Pycnonous Jocasus	Red-whiskered Bulbul	LC

21	Corvidae	Corvus splendens	House Crow	LC
22	Zosteropidae	Zasterops palpebrosus	Oriental White Eye	LC
23	Tamaliidae	Turdoides earlei	Striated Babbler	LC
24	Laniidae	Lanius cristatus	Brown Shrike	LC
25	Sylviidae	Prinia inornata	Plain Prinia	LC
26	Castioolidae	Orthotornus sutortus	Common tailordbird	LC
27	Apodiformes	Cypsurus balasiensis	Asian Palm Swift	LC
28	Coraciiformes	Merops orientalis	Gree Bee-Eater	LC
29	Meropidae	Coracias benghalensis	Indian Roller	LC
30	Coracudae	Haleyon pileata	Black-capped Kingfish	LC
31	Halcyonidae	Haleyon symrnensis	White-throated Kingfish	LC
32	Phalacrocoracidae	Phalacrocorax carbo	Great Cormorant	LC
33	Phalacrocoracidae	Phalacrocorax niger	Little Cormorant	LC
34	Threskiomithidae	Plegadis falcinelhus	Glossy Ibis	LC
35	Ardeidae	Ardea purpurea	Purple Heron	LC
36	Ardeidae	Ardea cinerea	Grey Heron	LC
37	Ardeidae	Lxobrychus cinnanioneus	Cinnamon Bittem	LC
38	Ardeidae	Nycticorax cycticorax	Black-crownedNight-Heron	LC
39	Accipitridae	Vhlvus migrans	Black –Kite	LC
40	Cisticolidae	Orthtomus sutorius	Common Tailorbird	LC
41	Ploceidae	Lonchua punctulata	Scaly-Breasted Munia	LC
42	Muscicapidae	Saxicola caprata	Pied Bushchat	LC

43	Fringillidae	Carduelis ambigue	Black-Headed Creenfinch	LC
44	Nectariniida e	Dicaeum concolor	Plan Flowerpecker	LC
45	Strigidae	Glaucidum cuculoidaes	Asian Barried Owlet	LC
47	Metropidae	Merops orientalis	Green Bee-Eater	LC
48	Apodidae	Cypsiurus balasiensis	Asian Palm Swift	LC
49	Passeridae	Passer domesticus	House Sparrow	LC
50	Pycnonotida e	Pycnonotus cafer	Red Vented Bulbul	LC

Table 13 Recorded Butterfly Species

Sr.	Order/ Family	Species	Common Name	Abundanc e Status
1	Nymphalidae	Tanaecia flora	Gray Pansy	Very Common
2	Nymphalidae	Hypolimnas bolma	Great Eggfly	Very Common
3	Nymphalidae	Athyma pertus	Common Sergeant	Very Common
4	Danaidae	Tirumala limniace	Blue Tiger	Common
5	Danaidae	Euploea klugii	Brown King Crow	Common
6	Danaidae	Danaus genutia	Common Tiger	Common
7	Satyridae	Mycalesis perseus	Common Bush Brown	Very Common
8	Pieridae	Delias hypereta indica	Common jezebel	Very Common
9	Pieridae	Appias pandione lagela	-	VerComm on
10	Pieridae	Apptas libythea	Striped albatross	Common

Sr.	Order/ Family	Species	Common Name	Abundance Status
11	Pieridae	Eurema hecabe	Common grass yellow	Common
12	Lytaenidae	Chilades larus	Lime Blue	Common
13	Hesperiidae	Caltoris kumara	Blank Swift	Very Common
14	Hesperiidae	Potantus serina	Large Dart	Very Common
15	Papilionidae	Papilio demoleus demoleus	Lime butterfly	Common
16	Pieridae	Lxias pyrene verma	Yellow Orange Tip	Very Common
17	Nymphalidae	Euthalia garruda	Common Baron	Common
18	Nymphalidae	Junonia lemonias	Lemon Pansy	Common
19	Nymphalidae	Parthenos Sylvia apicalis	Clipper	Common
20	Satyridae	Elymnias hypermnestra	Common Palmfly	Very Common
21	Satyridae	Ypthima asterope	Common Three-ring	Common
22	Lycaeriidae	Castalius rosimon		Very Common
23	Lycaeriidae	Arhopala sp	Oakblues	Common
24	Hesperiidae	Potanthus sp	Darts	Very Common
25	Papilionidae	Papilio memnon agenor (Male)	Great Mormon	Common
26	Papilionidae	Papilio memnon agenor (Female)	Great Mormon	Very Common
27	Papilionidae	Papilio polytes	Common Mormon	Very Common
28	Pieridae			

Sr.	Order/ Family	Species	Common Name	Abundance Status
29	Hesperiidae	Erynnis sp	Duskywing skippers	Common
30	Nymphalidae	Tanaecia flora	Gray Pansy	Very Common

Table 14 Recorded Dragon Fly Species

Sr.	Order/ Family	Species	Common Name	Abundance Status
1	Libellulidae	Crocothemis erythraea	Carmine Darter (Female)	Common
2	Libellulidae	Brachythemis contaminate (Male)	Ditch Jewel	Very Common
3	Libellulidae	Crocothemis nigrifrons	Black-headed Skimmer	Common
4	Libellulidae	Erythemis simplicicollis	Eastern Pondhawk	Common
5	Libellulidae	Potamarchacongener, Male		Common
6	Libellulidae	Orthetrum sabina	Slender Skimmer/ Green Marsh Hawk	Common
7	Libellulidae	Crocothemis servilia, Male	Scarlet Skimmer	Very Common
8	Libellulidae	Crocothemis servilia, Female	Scarlet Skimmer	
9	Libellulidae	Diplacodes trivialis Male	Chalky percher/ Ground skimmer	Very Common
10	Libellulidae	Pantala Flavescens, Male	Wandering Gilder	Common

Sr.	Order/ Family	Species	Common Name	Abundance Status
11	Libellulidae	Rhythemis phyllis	Yellow-striped Flutterer	Common
12	Libellulidae	Crocothemis servilia servilia (Female)	Scarlet Skimmer	Very Common
13	Libellulidae	Orthetrum sabina	Slender Skimmer Green Marsh Hawk	Common

Table 15 Reptilian & Amphibian Species

Sr.	Order/ Family	Species	Common Name	Typeof evidence
1	Microhylidae	Kaloula pulchra pulchra	Painted Common Bull Frog	Observed
2	Rhacophoridae	Polypedates leucomystax	Common Tree Frog	Observed
3	Rhacophoridae	Occidozyga lima	Common Floating Frog	Observed
4	Bufonidae	Dutlaphrynus melanostictus	True Toad	Observed
5	Dicroglossidae	Fejervarya limnocharis	Paddy Frog	Observed
6	Viperdae	Daboia russelii siamensis	Russell's viper	Interviewed
7	Colubridae	Xenochrophis flavipunctatus	Chequered keelback water anake	Observed
8	Colubridge	Xenochrophis flavipunctatus	Water snake	Interviewed
9	Colubridge	Ptyas korras	Indochinese rat snake	Interviewed

10	Agarmidae	Caltoes versicolor	Oriental Garden Lizard	Observed
11	Agarmidae	Branchocela cristatella	Green Crested Lizard	Observed
12	Agarmidae	Colotes mystaceus	Blue Crested Lizard	Observed
13	Scincidae	Mabuya multifasciata	East Indian Brown Mabuya	Observed

Table 16 Fish Species

Sr.	Scientific Name	English Name	Myanmar Name	Type of evidence
1	Lates calcarifer	Seabass	Ka Ka Tit	Observed
3	Johnius macropterus	Large eye Croakers	Nga Poke Thin	Observed
4	Glossogobius aureus	Golden Tank/ Golden Flated head goby	Ka Thabo	Observed
5	Natopterus notopterus	Bronze Featherback	Nga Phae	Observed
7	Ompok pabo	Sheat fish	Nga Nu Than	Observed
8	Osteobrama alfredianus	Carplet	Nga Phan Ma	Observed
9	Mystus cavaisus	Dwarf catfish	Nga Zin Yaing	Observed
10	Clarias batrachus	Common Cat fish	Nga Khu	Observed
11	Paraplagusia bilineata	Tongu Sole	Ng Khweshar	Observed
12	Macrobrachium rosenbergu	Freshwater Prawn	Yay Cho Pazun Thoke Gyi	Observed
13	Metapeneus monoceros	Speckled shrimp	Paun Bawt Jade	Observed
14	Channa striata	Striped snake head	Nga Yant	Observed
15	Polynmeus	Paradise	Nga Ponna	Observed

Sr.	Scientific Name	English Name	Myanmar Name	Type of evidence
	paradiseus	Threadfin		

Table 17 Recorded Flora Species

Sr.	Scientific Name	Family	Common Name	Habitat
1	Acacia auriculiformis A. Cunn.	Mimosaceae	Malaysia padauk	Tree
2	Albizia lebbek (L.) Benth.	Mimosaceae	Anya-koko	Tree
3	Albizia procera (Roxh.) Benth.	Mimosaceae	Sit	Tree
4	Alpinia officinarum Hance	Zingiberaceae	Padegaw-gale	Herb
5	Amomum sericeum Roxb.	Zingiberaceae	Hpala	Herb
6	Ampelocissus barbata (Wall.) Planch.	Vitaceae	Chin-baung-hmwe-sok	Climber
7	Angelonia goyazensis Benth.	Scrophulariaceae	Not known	Herb
8	Anthocephalus morindaefolius Korth.	Rubiaceae	Ma-u	Tree
9	Bambusa bambos(L.) Voss	Poaceae	Kyakat-wa	Bamboo
10	Barringtonia angusta Kurz.	Lecythidaceae	Kyi	Tree
11	Blumea balsamifera (L.) DC.	Asteraceae	Phon-ma-thein	Shrub
12	Borassus flabellifer L.	Arecaceae	Htan	Tree
13	Brerynia rhamnoides (Retz.) Muell. Arg.	Euphorbiaceae	Gonnyin-ya	Shrub
14	Butea monosperma (Lam.) Kuntze	Fabaceae	Pauk	Tree
15	Caryota mitis Lour.	Arecaceae	Min-baw	Tree

Sr.	Scientific Name	Family	Common Name	Habitat
16	Cayratia corniculata (Benth.) Gagnep.	Vitaceae	Not known	Climber
17	Ceiba pentandra(L.) Gaertn.	Bombacaceae	Le-moh-pin	Tree
18	Cephalandra indica Naud.	Crucubitaceae	Kinmon	Climber
19	Chromolaena odorata (L.) R.M. King &H. Robinson	Asteraceae	Bizat	Shrub
20	Chrysopogon aciculatus (Retz.) Trin.	Poaceae	Naukpo-myet	Grass
21	Cissus repens Lam.	Vitaceae	Not known	Climber
22	Clerodendrum japonicum Sweet	Verbenaceae	Not known	Shrub
23	Clitoria mariana L.	Fabaceae	Taw-peik-san	Herb
24	Colocasia affinis Schott	Araceae	Pein	Herb
25	Corypha umbraculifera L.	Arecaceae	Pe-bin	Tree
26	Costus speciosus Sm.	Costaceae	Phalan-taung-hmwe	Herb
27	Curcuma petiolata Roxb.	Zingiberaceae	Marlar	Herb
28	Cyperus corymbosus Rottb.	Cyperaceae	Thabaw-myet	Grass
29	Drynaria sp.	Polypodiaceae	Not known	Fern
30	Eclipta alba (L.) Hassk.	Asteraceae	Kyeik-hman	Herb
31	Ficus excelsa Wall.	Moraceae	Nyaung-thabye	Tree
32	Ficus rumphii Blume	Moraceae	Nyaung	Tree
33	Flueggea virosa (Roxb.ex Willd.)	Euphorbiaceae	Ye-chinya	Shrub
34	Globba racemosa Sm.	Zingiberaceae	Not Known	Herb
35	Glochidion coronatum	Euphorbiaceae	Tamasok	Shrub

Sr.	Scientific Name	Family	Common Name	Habitat
	Muell. Arg.			
36	Horsfieldia amygdalina (Wall.) Warb.	Myristicaceae	Not known	ST
37	Impatiens balsamina L.	Balsaminaceae	Dan-pan	Herb
38	Ipomoea carnea Jacq.	Convolvulaceae	La-tha-pan	Climber
39	Ipomoea mauritiana Jacq.	Convolvulaceae	Pan-kazun	Climber
40	Laportea interrupta (L.) Chew	Urticaceae	Phet-yar-pho	Herb
41	Leea aequata L.	Vitaceae	Kya-petthein	Shrub
42	Leucas cephalotes Spreng.	Lamiaceae	Pin-gu-hteik-peik	Herb
43	Marsilea quardrifoliata L.	Marsileaceae	Hmo-na-do	Herb
44	Microcos paniculata L.	Tiliaceae	Mya-yar	Tree
45	Mimosa pudica L.	Mimosaceae	Tikayon	Shrub
46	Neptunia oleraceae Lour.	Mimosaceae	Not known	Shrub
47	Osyris wightiana Wall.	Santalaceae	Zaung-gyan	Shrub
48	Oxystelma esculentun R. Br.	Asclepiadaceae	Kauk-yo-nwe	Climber
49	Parthenocissus dalzielii Gagnep.	Vitaceae	Not known	Climber
50	Phoenix loureiri Kunth	Arecaceae	Not known	Tree
51	Phyllanthus nanus Hook.f.	Euphorbiaceae	Mye-shit-sha-gale	Herb
52	Polygonum barbatum L.	Polygonaceae	Suzat-pan	Herb
53	Polypodium quercifolium	Polypodiaceae	Variegated Oak-leaf fern	Fern
54	Pyrrosia lingua	Polypodiaceae	Tongue fern	Fern
55	Samanea saman (Jacq.) Merr.	Mimosaceae	Thinbaw-kokko	Tree
56	Sandoricum koetjape	Meliaceae	Thitto	Tree

Sr.	Scientific Name	Family	Common Name	Habitat
	(Burm.f.) Merr.			
57	Scoparia dulcis L.	Scrophulariaceae	Dana-thuka	Herb
58	Sida acuta Burm. F.	Malvaceae	Not known	Shrub
59	Sida cordifolia L.	Malvaceae	Katsi-ne	Herb
60	Simarouba amara Aubl.	Simaroubaceae	Se thabye	Tree
61	Smilax prolifera Wall. Ex Roxb.	Smilacaceae	Sein-nabaw	Climber
62	Solanum indicum L.	Solanceae	Kazaw-kha	Shrub
63	Sonneratia griffithii Kurz	Sonneratiaceae	Tabyu lame	Tree
64	Spilanthes paniculata Wall.	Asteraceae	Shandon-po	Herb
65	Stereospermum fimbriatum (Wall. Ex G. Don) A. DC.	Bignoniaceae	Thakut-po	Tree
66	Streblus asper Lour.	Moraceae	Okhne	Tree
67	Tadehagi triquetrum (L.) H. Ohashi	Fabaceae	Lauk-thay	Shrub
68	Thysanolaena maxima (Roxb.) Kuntze	Poaceae	Tabyetsi	Grass
69	Urena lobata L.	Malvaceae	Wetchi-pane	Shrub
70	Vitis repens Wight &Am.	Vitaceae	Tapindaing mya nann	Climber
71	Ziziphus jujube Lam.	Rhamnaceae	Zi	ST