Initial Environmental Examination

April 2017

Myanmar: Third GMS Corridor Town Development Project
“Kayin State” (Part 1 of 3)

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Abbreviations & Acronyms

3Rs	Reduce, Reuse, Recycle
ADB	Asian Development Bank
APCF	Asia Pacific Carbon Fund
C:N	Carbon-Nitrogen (ratio)
CBO	Community-Based Organization
CBP	Capacity Building Program
CC	Climate Change
CDIA	Cities Development Initiative for Asia
CDM	Clean Development Mechanism
CH_4	Methane
CO_2	Carbon Dioxide
DFR	Draft Final Report
DUHD	Department of Urban Housing Development (MOC)
EA	Executing Agency
EA	Environmental Assessment
ECC	Environmental Compliance Certificate
ECD	Environmental Conservation Department
EIA	Environmental Impact Assessment
EHS	Environment, Health and Safety
EMP	Environmental Management Plan
FSR	Feasibility Study Report
GHG	Greenhouse Gas
GMS	Greater Mekong Sub-Region
GNP	Gross National Product
GoM	Government of Myanmar
HDPE	High Density Polyethylene

IA	Implementing Agency
IEE	Initial Environmental Examination
IFI	International Finance Institution
ISWM	Integrated Sustainable Waste Management
JICA	Japan International Cooperation Agency
m^3	cubic meter
MoECAF	Ministry of Environment Conservation and Forests
MoNREC	Ministry of Natural Resources and Conservation (ex-MoECAF)
MMK	Myanmar Kyat
MSW	Municipal Solid Waste
MW	Megawatt
NECC	National Environmental Conservation Committee
NGO	Non-Government Organization
NPK	Nitrogen, Phosphorous, And Potassium
PIU	Project Implementation Units
PPTA	Project Preparatory Technical Assistance
SPS	Safeguard Policy Statement
TA	Technical Assistance
WWTP	Waste Water Treatment Plant

EXECUTIVE SUMMARY (ENGLISH)

The Third GMS Corridor Town Development Project focuses on the towns of Hpa-An and Myawaddy in Kayin State. The Project intends to significantly improve the environmental conditions in the two cities and the quality of life of its population through the improvement of water supply and solid waste facilities.

Water supply is presently insufficient in terms of serviced areas, service duration, quantities supplied and water quality. The Project beneficial impacts are the followings:

In Hpa-An

- Improvement of the water supply efficiency by the mobilisation of new water intake in Thanlwin River;
- Improvement of water supply security by increasing the water supply storage capacity in Hpa-An through the construction (i) of a new 3,000 m^3 water storage on Bare Mae Hill in replacement of 3 old reservoirs and (ii) of a new 3,000 m3 reservoir on Kyar Inn Mountain;
- Improvement of public safety through the construction of a water treatment plant with a capacity of 10,000 m3/day (and a possibility to extend to 18,000 m^3/d in a second phase), based on rapid sand filtration process with disinfection by chlorine;
- Creation of transmission lines and distribution lines including 21.2 km of transmission lines and main networks (diameters from 200-400 mm) and 79.1 km of distribution system (including tertiary networks <= 200 mm). The project would also include a fund to finance over 10 000 new connections.

In Myawaddy

- Improvement of the water supply efficiency by the mobilisation of new water intake by infiltration gallery along Thaungyin (Moei) River;
- Improvement of water supply security by increasing the water supply storage capacity in Myawaddy through the construction of a new 4,500 m^3 water storage;
- Improvement of public safety in Hpa-An and Myawaddy through the construction of a water treatment plant, with a capacity of 9,000 m3/day, based on rapid sand filtration process with disinfection by chlorine;
- Rehabilitation and expansion of distribution network in wards 1,2,5 and a part of ward 4.

Solid waste management is a major environmental issue in Hpa-An and Myawaddy where only respectively 35% and 50% of the solid wastes are collected at present.

The remaining uncollected waste is dumped all over the cities where the waste either decays with unpleasant smells and proliferation of insects or is burnt by the residents with emission of unpleasant and dangerous smoke as materials like plastics are also burnt. The collected waste is disposed in Hpa-An in a dumping site where it is regularly burnt in the dry season and from where untreated leachates are discharged into the surface water bodies. In Myawaddy, collected wastes are dumped in three sites. Two of them located within the urban area on the Thaungyin River bank are now being closed at the time of this report and a new dump site has been recently created west of the city. Large quantities of

waste are dumped into the storm drainage networks, clogging the drains and creating localised flooding during the rainy season.

The solid waste component beneficial impacts in Hpa-An and Myawaddy include:

- Improvement of quality of life and public health by (i) increasing the collection rate of solid waste in the city and (ii) improving collection points facilities;
- Improvement of storm drainage efficiency by reducing the amount of waste dumped into the drains and clogging the system;
- Reduction of water pollution load by improved collection rate and construction of a sanitary landfill with leachate collection and treatment in each town;
- Reduction of air emissions and particularly GHG through (i) construction of a composting plant on the landfill site and (ii) collection of landfill gas and flaring;
- Improvement of waste recycling efficiency resulting in secondary beneficial environmental impacts through significant avoidance of GHG emission;

With the exception of Hpa-An new storage on Kyar-Inn mountain located on lands owned by monastery communities but presently unused and the WTP on floodable land privately owned, none of the other Project components requires land acquisition as they are all developed on Hpa-An or Myawaddy TDC land or on Kayin State Government land. Water distribution networks are located in public areas (roads and streets).

None of the Project components involves significant forest clearing or encroachment into valuable wetland or other conservation area. Only few urban trees may be cut depending on the detailed design of each component, but EMP shall limit the cutting and impose the plantation of 2 new trees per cut tree.

The project will support innovation with (i) the construction of the first composting plants in Myanmar, attached to the landfill of each city and (ii) the equipment of each proposed new landfill with a system of gas collection and flaring. When compared with the situation without project, the solid waste component of the Third GMS in Kayin State will reduce the annual emission of GHG from generated waste in 2020 by 13,500 tons CO2-eq/year for Hpa-An and by 18,500 tons CO2-eq/year for Myawaddy. GHG abatement shall reach in 2040 42,500 tons CO2-eq/year for Hpa-An and 66,700 tons CO2-eq/year for Myawaddy.

The IEE also considered climatic trends at the national, regional and local scale in Myanmar and more specifically in Hpa-An for which long term climatological data is available. Both temperature and rainfall show increasing trends in Hpa An along the last 50 years of observations, in line with the MONREC analysis for the Kayin State. Annual rainfall didn't change significantly over the last 50 years. Among the wet season months (May to October), only the months of June, July and September show an increasing trend, with July showing the highest raise during the 50 years period (about 120 mm, or 24 mm per decade).

Temperature rise was more significant during the same period. The average annual maximum temperature increased by 2,2°C over the last 48 years, or an increase of almost 0,5°C per decade, a value significantly higher than what is considered as an average increase in the Kayin State (0.32°C per decade). July and February increased by about 4°C during the period while the other dry

season months increased by 2 to 3 °C. Wet season months increase was only about 1°C during the same period.

The results of AWARE model were considered in the preparation of the IEE Report. In this connection, climate change and natural hazards considerations had been incorporated in the IEE. AWARE was used by the ADB to undertake an initial climate risk screening exercise. The results had rated the project as MEDIUM RISK and have identified flooding and landslide as a high level risk factor as the project is located in a region which has experienced recurring flood events in the recent past. However, the effective risk level is dependent on local geographical factors. On this basis, due to the location of Hpa-An and Myawaddy in flat or smoothly undulating areas, the risk for landslide may be considered as low. Hpa-An experiences infrequent flooding mainly localized next to the Thanlwin River where the water intake is located and around the central lake (which level varies according to Thanlwin river level) near which the WTP is located. Both sub-components integrate flood level constraints into their design, including a safety board for climate change risk. Following such design principles, the Project components shall not be affected or put at risk by climate change.

A screening carried out during the Interim phase of the Project (based on Rapid Environmental Assessment –REA- checklists of the ADB) confirmed that environmental impacts raised by the project were either very beneficial or mainly related (i) to the risks of nuisances during the construction phase but easily controllable by appropriate construction site supervision and conventional mitigation measures and (ii) during operation, to typical risks in relation to WTP and landfill management but also easily avoidable considering the simple technology applied and the small size of the projects. Consequently, the proposed categorisation of the Project was B, involving the preparation of the present IEE. The conclusions of the present report confirm this initial categorization as category B Project.

Aside from the several and undisputable beneficial impacts of the Project in Hpa-An and Myawaddy, some potential but limited risks are still to be considered should the management program anticipated be deficient:

- Most of the anticipated environmental and social impacts are related to nuisances which may happen during the construction activities. Because of the project located in an urban environment, risk of nuisances is higher: traffic congestion, temporary alienation of access, temporary disruption of community facilities, noise and engine gas and dust release may temporarily disturb the nearby communities. However, recommendations formulated in the present EMP combined with a solid environmental contractual framework and an effective inspection and supervision of construction sites will definitely reduce these risks to acceptable levels.
- Impacts related to water treatment plant operation (pollution from sludge, contamination of water resource) can be also avoided by appropriate management measures already discussed in the IEE. Monitoring of rivers water quality and of treated water is considered to ensure compliance and reduce the risk of supplying contaminated water.
- Impacts related to landfill operation (gas emission and pollution by leachate) are unlikely to occur as design already consider gas collection and flaring and leachate collection and treatment. However, monitoring of gas emission, leachate and adjacent underground water table is considered to ensure compliance.

The EMP emphasises (i) the need for EHS capacity building for KSG, the PMO and the PIU staff, (ii) the need for very strict and detailed EHS specifications for the tender documents and (iii) the need for strict EHS enforcement through monitoring of construction activities.

Conclusion. Assuming that the mitigation measures and monitoring requirements described in the Environmental Management Plan are effectively implemented, the Project is not expected to have a significant adverse environmental impact.

EXECUTIVE SUMMARY (MYANMAR)

- (i) (□) 3,000 m^3 (ii) 3,000 m^3
- Chlorine 10,000 m^3
- 35% □□ 50% 50%

[illegible] ([illegible]) [illegible]

[illegible] -

- [illegible] (i) [illegible] (ii) [illegible]
- [illegible]
- [illegible] Station [illegible]
- [illegible]
- (i) Composting Plant [illegible] (ii) [illegible] ([illegible]) [illegible]
- [illegible]
- [illegible]

[illegible]

EMP

(i) Composting Plant (ii)

13,500 CO2-eq/year 18,500 CO2-eq/year 425,000 CO2-eq/year 667,000 CO2-eq/year

IEE (

120 mm ( ) 24 mm

48 2.2 C 0.5 C 0.32 C

[illegible] 2 □C [illegible] 3 □C [illegible] 1 □C [illegible]

[illegible] IEE [illegible] AWARE [illegible] AWARE [illegible] ADB [illegible] (□) [illegible]

[illegible] ([illegible] ´□´) [illegible] `□´ [illegible]

[illegible]

(i) [illegible]

(O&M activities)

(EMP)

(ii)

EMP OHS

EMP (i) MTDO , PMG PIO ADB (ii) EMS (iii) EHS

1 INTRODUCTION

1.1 Project Categorization

A preliminary screening exercise of the proposed Project components, based on the latest applicable Rapid Environmental Assessment (REA) Checklists proposed by the ADB (REA Urban Development, REA Water Supply, REA Sewage Treatment and REA Solid Waste Management), was initially carried out by the ADB in June 2014. The screening was updated in 2015 and presented in the Interim Report (August 2015) and led to the following conclusions:

The Project will provide major improvements regarding urban environment and quality of life of the residents;

- Projects components are not anticipated to significantly affect water, soil or air quality in the Project area;
- No detrimental impacts are anticipated on the long term. Most critical period will be the construction period, as many of the works will occur in densely urbanized areas. However, impacts can be strongly minimized, even avoided if good environmental practices are integrated in the Construction EMP and in the EHS specifications for construction contractors, and effectively enforced on sites through a solid and efficient monitoring. These requirements are described in the present IEE-EMP.
- The Project will have limited land acquisition and resettlement implications, as most of the project components have already been designed in order to avoid/minimize land acquisition and resettlement.

Considering (i) the major beneficial impacts on the urban environment of Hpa-An and Myawaddy, (ii) the anticipated limited environmental impacts from the Project components and (iii) the limited potential impacts on land acquisition and resettlement, the present Project was classified as an ADB category B. This categorization has been confirmed during the preparation of this IEE as discussed later. This IEE is complemented (i) by a Resettlement Plan (RP) to address in details land acquisition and resettlement issues and (ii) by a full EMP encompassing construction and operation period with a particular focus on the construction period, recognizing that many of the construction activities will be located within sensitive urbanized areas.

Considering the Myanmar environmental regulations, the study level also complies with the regulatory requirement of the draft EIA Procedures (6th edition).

1.2 Purpose of EIA/IEE

This report gives an account of the Environmental Assessment (EA) of the proposed Third GMS Corridor Towns Development Project. The IEE was conducted as part of the Project preparation with the following purposes:

- To ensure the environmental soundness and sustainability of the project;
- To support the integration of environmental as well as climate change and natural hazards considerations into the project decision-making process;

- To identify early potential impacts and risks arising from the proposed Project components on the physical, biological, socio-economic and cultural environment;
- To identify measures to avoid, minimize, mitigate or compensate for adverse impacts and enhance positive impacts, and
- To lead to overall environment improvements in the project area of influence.

The present EIA was carried out in compliance with the Safeguard Policy Statement (SPS, June 2009) of the Asian Development Bank (ADB) and with reference to the Draft Procedure for Environmental Assessment (6th edition) prepared by the Myanmar Government under the 2012 Environmental Conservation Law.

1.3 Report Organization

The Initial Environmental Examination follows a conventional layout for this type of report and integrates an Environmental Management Plan (EMP).In addition to this introduction the reader will find the following Sections in this report:

- The Executive Summary;
- This introduction with the project rationale (Section 1)
- The applicable Institutional and Regulatory Framework (Section 2);
- The description of the proposed Project components (Section 3);
- The Baseline Situation (Section 4);
- The Impact Analysis (Section 5);
- The Alternative Development options (Section 6);
- The Public Consultation activities (Section 7);
- The Grievance and Redress Mechanism proposed (Section 8)
- The Environmental and Social Management Plan (Section 9)
- Conclusions & Recommendations (Section 10)
- Appendices

2 POLICY, INSTITUTIONAL & LEGAL FRAMEWORK

2.1 Myanmar Environmental Laws, Regulations and Standards

2.1.1 HISTORICAL BACKGROUND

The National Commission on Environmental Affairs (NCEA) was formed in 1990 with the purposes of setting environmental standards and creating environmental policies for utilizing natural resources and controlling environmental pollutions. It was organized as a division under the Ministry of Foreign Affairs in April 1992. NCEA has adopted a National Environmental Policy (NEP) in 1994 to ensure the incorporation of environmental concerns in planning for economic development. The NEP emphasizes "the responsibility of the State and every citizen to preserve its natural resources in the interest of present and future generations". In 2005, NCEA was transferred under the Ministry of Forestry.

The Ministry of Forestry was upgraded in September 2011 as the Ministry of Environmental Conservation and Forestry (MOECAF) and then Ministry of Natural Resources and Conservation (MONREC) in 2016, the focal and coordinating agency for the overall environmental management in Myanmar.

The Environmental Conservation Department (ECD), one of the six departments under the MOECAF is responsible for implementing National Environmental Policy and to manage natural resources conservation and pollution control on water, air and land. The main ECD responsibilities include:

- Development of legislation related to environmental regulations, guidelines and procedures;
- Coordination of environmental conservation activities;
- Development of plans on climate change mitigation and adaptation, on desertification control and ozone layer protection;
- Preparation of national report in relation with international agreements.

When the MOECAF was created, the NCEA disappeared and its members were transferred to the ECD. The National Environmental Conservation Committee (NECC) was then established in April 2011 by ECD which selected representatives from most Ministries to participate to this committee.

On March 17th, 2016, the newly seated Pyihtaungsu Hluttaw announced an important reorganization of the Union Ministries, reducing the overall number from 36 ministries to 21. A total of 10 ministries have been merged. The Ministry of Environmental Conservation and Forestry (MOECAF) has been merged with the Ministry of Mines (MOM) to create the new **Ministry of Natural Resources and Environmental Conservation (MONREC).**

2.1.2 BACKGROUND OF LAWS AND REGULATIONS

Myanmar has already legislation and regulations which relate to natural environmental aspects dating prior to its independence. For instance, the Forest Act and the Burma Wildlife Protection Act have been enacted respectively in

1902 and 1936 for the sustainability of the forest products. Amended versions of such earlier act and newly promulgated one give a perspective on the existing legal and administrative framework concerning the environmental affairs in Myanmar.

The Myanmar Agenda 21 was formulated in 1997 in response to the call of the Earth Summit to develop national strategies to implement the Global Agenda 21. The Myanmar Agenda 21 made recommendations for the drafting and promulgation of a framework law which can further promote the integration of environmental and developmental concerns in the decision making processes of the country.

Present major laws and regulations with relation to environmental management are summarized in following Table.

Table [1] APPLICABLE ENVIRONMENTAL, HEALTH AND SAFETY (EHS) LAWS & REGULATIONS IN MYANMAR

Laws and Regulations	Year	Purpose/Description
Environmental Conservation Law	2012	This law provides the basis for the conservation and protection of the natural environment of Myanmar including the marine environment. The ECL provides the common principles of environmental conservation and for other environmental laws and policy. The Environmental Conservation Committee (ECC) within the Ministry of the Natural Resources and Environmental Conservation (MONREC) was formed to oversee implementation, enforcement, and further development of the ECL including providing education and assistance to government agencies and proponents with the requirements of the ECL. The ECC also plays a lead role in managing environmental disputes.
Myanmar Environmental Conservation Rules	2014	These place responsibility on the Government to establish and adopt the necessary programs for the conservation and enhancement of environment, protection, control and reduction of pollution in environment, and conservation. Articles 52, 53 and 55 of the Rules states that all Projects and Project expansions undertaken by any ministry, government department, organization, corporation, board, development committee and organization, local government or authority, company, cooperative, institution, enterprise, firm, partnership or individual (and/or all Projects, field sites, factories and businesses including expansions of such Projects, field sites, factories and businesses identified by the Ministry, which may cause impact on environmental quality and are required to obtain Prior Permission in accordance with Article 62 of the Rules) having the potential to cause Adverse Impacts, are required to undertake IEE or EIA or to develop an EMP, and to obtain an ECC from MONREC.

Laws and Regulations	Year	Purpose/Description
Environmental Impact Assessment Procedures	2015	The EIA procedures states that all projects undertaken by a ministry, government department, organization, corporation, board, development committee, local government or authority, company, cooperative, institution, enterprise, firm, partnership or individual that could cause significant adverse environmental or social impacts are subjected to screening for either and IEE or EIA, and ultimately require an Environmental Compliance Certificate (ECC) from MONREC before being allowed to proceed. The EIA process involves (i) screening, (ii) scoping for EIA, (iii) EIA/IEE preparation and review, (iv) EIA/IEE approval, and (v) appeal. The procedures includes project categorization which helps determining whether such project or activity will be required to conduct an IEE, an EIA or an EMP. The article 13 of the procedures states that the appropriate public consultation is required through all phases of the IEE and EIA. Regarding the Resettlement and Indigenous People, in the article 7, chapter 2 of the procedures states that projects that involve Involuntary Resettlement or which may potentially have an Adverse Impact on Indigenous People shall comply with specific procedures separately issued by the responsible ministries. Prior to the issuance of any such specific procedures, all such Projects shall adhere to international good practice (as accepted by international financial institutions including the World Bank Group and Asian Development Bank) on Involuntary Resettlement and Indigenous Peoples.
Conservation of Water Resources and Rivers Law	2006	To conserve and protect the water resources and rivers system for beneficial utilization by the public; to protect environmental impacts for the abuse use of water resources. Law strictly prohibits disposal of engine oil, chemical, poisonous material and other which may cause damage, or dispose of explosives from the bank or from a vessel.
Forest Law	1992	The Forest Law, 1992 highlights forest protection, environmental and biodiversity conservation, and extended set-up of the permanent forest estates (PFE) and protected areas system (PAS). It provides opportunities for the promotion of private sector involvement in reforestation and timber trade, and decentralizes management responsibilities. It encourages community participatory approach in managing forest resources, particularly to satisfy the basic needs of the rural people. It demonstrates a shift from the concept of revenue generation and restriction to motivation and share of management responsibility with people.

Laws and Regulations	Year	Purpose/Description
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. The Law highlights habits maintenance and restoration, protection of endangered and rare species of both fauna and flora, establishment of new parks and protected areas, and buffer zone management.
National Environmental Policy	1994	To ensure sound environmental policies in the utilization of water, land, forest, mineral resources and other natural resources in order to conserve the environment and prevent its degradation.
Law of Mon State Development Affair	2012	It provides information on the policy, regulations on the solid waste management and drainage facilities management, and includes supervision of construction, renovation and extension of a building.
Law of Kayin State Development Affair	2013	It provides information on the policy, regulations on the solid waste management and drainage facilities management, and includes supervision of construction, renovation and extension of a building.
Protection and Preservation of Cultural Heritage Regions Laws	1998	To implement the protection and preservation policy with respect to perpetuation of cultural heritage that has existed for many years; to protect and preserve the cultural heritage regions and the cultural heritage. New project in such sensitive areas is required to get prior approval from the Culture
The Underground Water Act	1930	This Act provides the requirement for systematic use of ground water toward sustainable purpose.
Public Health Law	1972	For promoting and safeguarding public health and to take necessary measures in respect of environmental health.
Prevention and Control of Communicable Diseases Law	1995 Revised in 2011	The Law highlights the functions and responsibilities of health personnel and citizens in relation to prevention and control of communicable diseases. It also describes measures to be taken in relation to environmental sanitation, reporting and control of outbreaks of epidemics and penalties for those failing to comply. The law also authorizes the Ministry of Health to issue rules and procedures when necessary with approval of the government
Factory Act	1951	For effective management in every factory for disposal of waste and effluent, and matters on health, cleanliness and precaution against danger.
Agricultural Land Law	2012	To protect the rights of the people working on the farmland.
National Biodiversity Strategy and Action Plan	2012	The NBSAP acts as the major guiding document for planning biodiversity conservation in the country, following its goal to provide a strategic planning framework for the effective and efficient conservation and management of biodiversity and natural resources

Laws and Regulations	Year	Purpose/Description
		based on greater transparency, accountability and equity.
Myanmar Investment Law	2012	This Law makes sure not to cause environmental pollution or damage in accord with existing laws in respect of investment.
Myanmar Investment Rules	2013	The Myanmar foreign investment rules contain several elements dealing with environmental protection, including: Art. 33. Proposals for economic activities that are considered capital intensive by the Commission, and that are prescribed to undergo environmental impact assessment by the Ministry of Environmental Protection and Forestry have to be submitted along with Environmental and Social Impact Assessment. Art. 54. The promoter or investor shall: (a) comply with Environmental Protection Law in dealing with environmental protection matters related to the business; Art. 123. If it is scrutinized and found out that the investor has carried out business that causes environmental pollution or has not taken action to minimize environmental pollution at the land for which he is entitled to lease or use, or if it is scrutinized and found that the work carries out causes nuisance to the persons who reside around such place due to noise or by culture and if relevant persons officially object, the Commission may terminate the lease or tendering right to use after making necessary inquiry. Art. 125. The investor, for operating any business, does not have the right to lease and develop the following lands: (a) religious lands; (b) cultural heritage and natural heritage regions designated by relevant Ministries; (c) lands restricted for Union defence and security; (d) lands under litigation; (e) lands restricted by the State from time to time; (f) lands where exists place or building which may cause situations such as impact on public environment noise, pollution, impact on culture within urban residential area due to the business of the investor.
National Sustainable Development Strategy	2009	This strategy concerns the sustainable management of natural resources, integrated economic development, and sustainable social development.
Conservation of Water Resources and Rivers Law (2006)	2006	This Law aims to conserve and protect the water resources and river systems for beneficial utilization by the public, to smooth and enhance safety of waterways navigation along rivers and creeks, to contribute to the development of State economy through improving water resources and river systems, and to protect environmental impact.

Laws and Regulations	Year	Purpose/Description
Enacted Laws related to Labour and Safety	Mainly 2011-2016	Laws and Rules applicable for the construction and operation of the projects: Labour Organization Law & Rules (2011) Settlement of Labour Dispute Law & Rules(2012) Edited Settlement of Dispute Law(September, 2014) Social Security Law (2012) Social Security Rule (2012) Minimum Wages Law (2013) Minimum Wages Rule Employment and Skill Development Law Leave and Holiday Law (1951) Amended Law for Leave and Holiday Law 1951(July 2014) Payment of Wages Law (Jan 2016)

2.1.3 APPLICABLE ENVIRONMENTAL STANDARDS

In December 2015 MONREC released Myanmar Environmental Quality (Emission) Guidelines. The guidelines cover both water and atmosphere emissions related to a wide range of production industries. Most of the proposed standards refer to the Environmental, Health and Safety Guidelines of the IFC (2007). Concerning treated wastewater discharges (Section 1.2), proposed standards refer also to IFC EHS guidelines. Emission guidelines related to leachate discharges from municipal solid waste landfills and emissions from incinerators are presented in following Tables. With respect to drinking water standards the MONREC guidelines refer to the National Drinking Water Guidelines recently introduced by the National Water Council and based on WHO Guidelines and Standards for drinking water.

Table [2] EMISSION QUALITY STANDARDS APPLICABLE TO TREATED MUNICIPAL WASTEWATER EFFLUENTS

Parameter	Unit	Maximum Concentration
Biological oxygen demand	mg/L	30
Chemical oxygen demand	mg/L	125
Oil and grease	mg/L	10
pH	S.U.	6-9
Total coliform bacteria	MPN[a]/100 ml	400[b]
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

[a] MPN = Most Probable Number
[b] Not applicable to centralized, municipal wastewater treatment systems

Table [3] EMISSION QUALITY STANDARDS APPLICABLE TO LEACHATE FROM MUNICIPAL WASTE LANDFILLS

Parameter	Unit	Daily Maximum	Monthly Average
5-day Biochemical oxygen demand	mg/l	140	37
Ammonia	mg/l	10	4.9
Aniline		-	-
Arsenic	mg/l	-	-
alpha Terpineol	mg/l	0.033	0.016

Parameter	Unit	Daily Maximum	Monthly Average
Benzoic Acid	mg/l	0.12	0.071
Chromium (total)	mg/l	-	-
Naphthalene	mg/l	-	-
p-Cresol	mg/l	0.025	0.014
pH	S.U.	6-9	6-9
Phenols	mg/l	0.026	0.015
Pryridine	mg/l	-	-
Total suspended solids	mg/l	88	27
Zinc	mg/l	0.2	0.11

2.1.4 NATIONAL EIA REQUIREMENTS AND FRAMEWORK

In accordance with the recommendations of the 2012 Environmental Conservation Law, MONREC has prepared a procedure for the Environmental Assessment (EA) of development projects. This procedure is still in a draft form (version 42 latest) but is already virtually enforced by MONREC.

From the information gathered from the draft procedure, the PPTA Consultant has prepared a tentative flowchart depicting the various stages of the procedure and the formal review/approval steps by MONREC.

MONREC should be solicited 3 times during the preparation process of a local IEE/EIA:

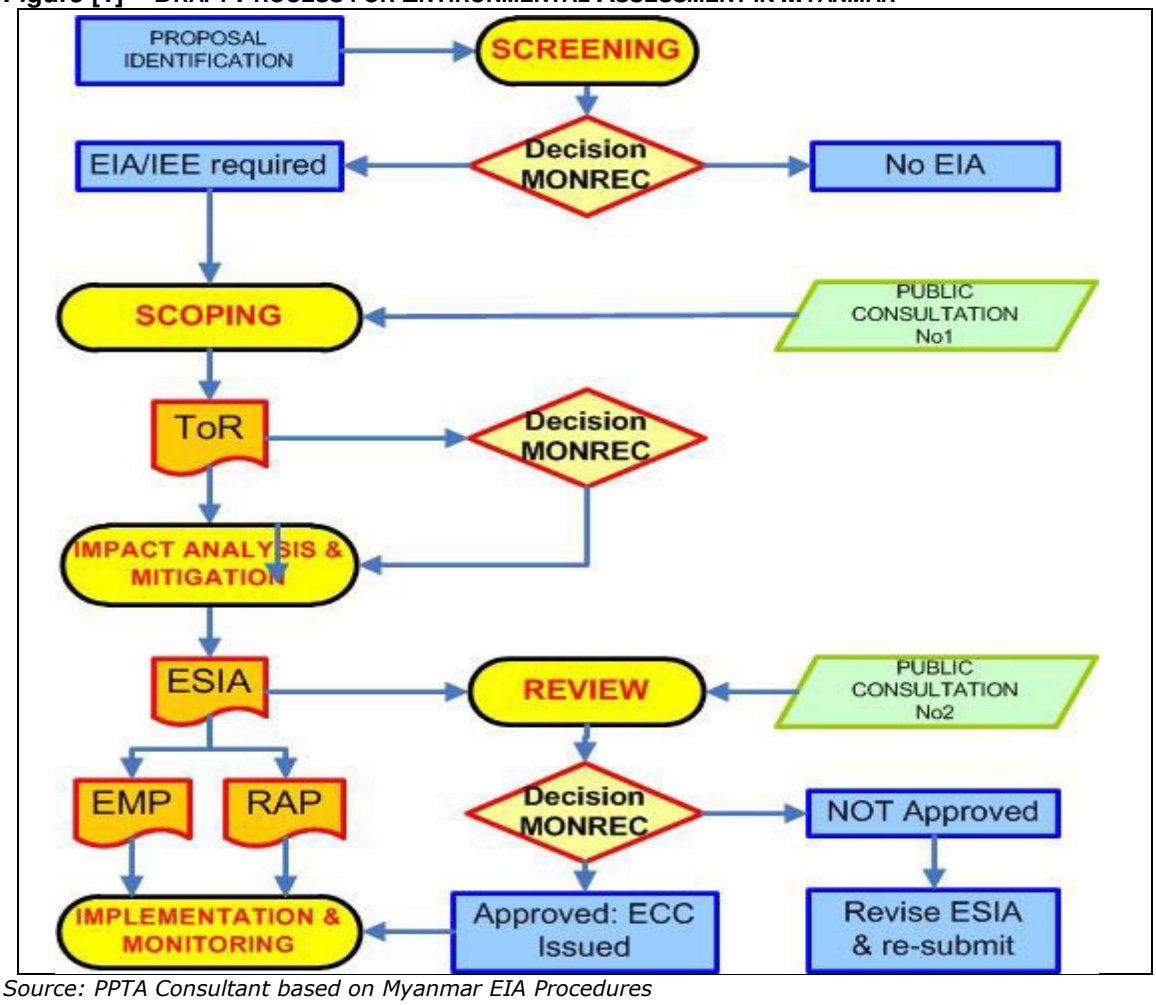
- at project proposal stage (screening), to decide if EIA or IEE is required or not
- before the start of the EIA study to approve (i) the Terms of Reference for the EIA and (ii) the qualification of the Consultant proposed for carrying out the EIA;
- at submission stage of the IEE/EIA draft report for comments and then issuance of the ECC.

Two public consultations are also considered. This process, as shown in following figure is quite comparable with ADB requirements regarding the EA main process stages.

In parallel to the preparation of the IEE documentation by the PPTA Consultant for ADB, it is required by the national procedure on EA that a local EIA report is submitted to MONREC. In order to avoid delay in the eventual implementation of the project, the required EA steps have been undertaken by the Executing Agency in parallel with the progress of the PPTA IEE, benefiting fully from the work done by the PPTA Consultant.

In terms of report content, the EIA requirement for Myanmar covers both environmental and social while for ADB SPS, these come separately in the EIA/IEE for environment and the RAP (and other types of documents) for the social aspects (baseline, resettlement, livelihood restoration). Compilation of information for reporting to MONREC relied on these documents from PPTA.

Figure [1] DRAFT PROCESS FOR ENVIRONMENTAL ASSESSMENT IN MYANMAR



Source: PPTA Consultant based on Myanmar EIA Procedures
Note: ECC=Environmental Compliance Certificate

Table [4] COORDINATION BETWEEN ADB AND MONREC REQUIREMENTS

Steps in Myanmar EA Procedure	Links with ADB PPTA EIA/IEE	Schedule
Submission of Project proposal	Project proposal to be submitted to MONREC by the Proponent (KSG) must be based on the final list of project components approved by proponent following PPTA Interim report and workshop	MONREC is required within 15 days of receiving a project proposal, to perform screening and determine the type of environmental assessment (EIA, IEE or none) required
Preparation of EIA Scoping and ToR	ToR may partly rely on the ADB ToR related to the Environmental and Social tasks of the PPTA, and be complemented as necessary by any issue identified during the public consultation activities. Project proponent must appoint a consultant registered/qualified to prepare scoping and ToR.	MONREC is required to provide decision on firm's qualification within 7 days, and to provide approval of scoping and EIA ToR within 15 days upon submission of documents by proponent

Steps in Myanmar EA Procedure	Links with ADB PPTA EIA/IEE	Schedule
Preparation of EIA report	Preparation of the EIA/IEE report will be based on the EIA/IEE and RAP reports prepared by the PPTA Consultant.	Report preparation to start when PPTA EIA/IEE is submitted to or approved by ADB
Public Consultations	Myanmar EA procedure requires 2 public consultations. ADB SPS requires minimum of 2 consultations for category A project (with full EIA) and minimum 1 for category B (with IEE)	Public consultation activities of PPTA Consultant to be fully considered in EIA report for MONREC

2.1.5 INTERNATIONAL TREATIES

Myanmar has also made commitments to the following international agreements and protocols on environmental, social, safety and occupational issues as shown in table below.

Table [5] INTERNATIONAL AGREEMENTS ON ENVIRONMENT, SOCIAL AND SAFETY

International Agreement	Date of Signature	Date of Ratification	Date of Membership	Cabinet Approval	Relevance to Project
United Nations Framework Convention on Climate Change, New York, 1992 (UNFCCC)	11/06/1992	25/11/1994 (Ratification)	-	41/94 (09/11/1994)	Yes (GHG reduction)
Convention on Biological Diversity, Rio de Janeiro, 1992	11/06/1992	25/11/1994 (Ratification)	-	41/94 (09/11/1994)	Yes but limited as urban environment
International Tropical Timber Agreement (ITTA), Geneva, 1994	06/07/1995	31/1/1996 (Ratification)	-	-	No
Vienna Convention for the Protection of the Ozone Layer, Vienna, 1985	-	24/11/1993 (Ratification)	22/2/1994	46/93	No
Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1987	-	24/11/1993 (Ratification)	22/2/1994	46/93	No

International Agreement	Date of Signature	Date of Ratification	Date of Membership	Cabinet Approval	Relevance to Project
London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London, 1990	-	24/11/1993 (Ratification)	22/2/1994	46/93	No
The Convention for the Protection of the World Culture and Natural Heritage, Paris, 1972	-	29/4/1994 (Acceptance)	-	6/94	Yes in Mawlamyine
United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and / or Desertification, Particularly in Africa, Paris, 1994 (UNCCD)	-	02/01/1997(Accession)	02/04/1997	40/96 (4-12-96)	No
Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, D.C., 1973; and this convention as amended in Bonn, Germany,1979 (CITES	-	13/6/1997 (Accession)	11/09/1997	17/97 (30-4-97)	No
ASEAN Agreement on the Conservation of Nature and Nature Resources, Kuala Lumpur, 1985	16/10/1997	-	-	-	No
Cartagena Protocol on Biosafety, Cartagena, 2000	11/5/2001	-	-	13/2001 (22-03-2001)	No

International Agreement	Date of Signature	Date of Ratification	Date of Membership	Cabinet Approval	Relevance to Project
ASEAN Agreement on Transboundary Haze Pollution	10/06/2002	13/3/2003 (Ratification)	-	7/2003 (27-02-2003)	No
Kyoto Protocol to the Convention on Climate Change, Kyoto, 1997	-	13/8/2003(Accession)	-	26/2003 (16-07-2003)	Yes
Stockholm Convention on Persistent Organic Pollutants (POPs), 2001	-	18-4-2004 (Accession)	18/7/2004	14/2004 (01-04-2004)	No
Sendai Framework for Disaster Risk Reduction, UNISDR, 2015	-	-	2015	-	?

2.2 ADB Environmental Safeguards Policy

In 2005, the Asian Development Bank embarked on a review process of its three safeguard policies on the environment, involuntary resettlement and Indigenous Peoples. The 2009 Safeguard Policy Statement (SPS) is the result of this four-year process. NGO Forum on ADB's network members was heavily involved in monitoring and commenting the review process.

The new Safeguard Policy Statement (SPS) became effective in January 2010. It replaced the ADB's previous separate policies on each of these areas: Policy on Indigenous People (1998), Involuntary Resettlement Policy (1995) and Environment Policy (2002). Key documents related to the new Policy include:

- ADB, 2009. Safeguard Policy Statement, Manila.
- ADB, 2012. Environment Safeguards, a Good Practice Sourcebook, Draft Working Document, Manila.

The standards contained in the ADB's SPS have far-reaching impacts. They determine the ADB's environmental and social obligations for its annual and rising lending volume and influence emerging national legal frameworks in Asia. Due to the Bank's increasing support for private sector operations, the Safeguard Policy Statement also determines how private financing, supported by the ADB, operates in Asia.

The overarching statement on ADB's Commitment and Policy Principles (Chapter V) says that the ADB's safeguards have the following objectives (SPS, p 15): i) avoid adverse impacts of projects on the environment and affected people, where possible; ii) minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and iii) help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

2.2.1 GENERAL REQUIREMENTS

The Policy Delivery section (Chapter V B, paras. 53–64) lists general requirements that the ADB is obliged to follow in regard to: project screening and classification, information disclosure, consultation and participation, due diligence, monitoring and reporting, local grievance redress mechanisms and the Bank's Accountability Mechanism.

- Project screening and classification: The Policy stipulates that the ADB will undertake project screening as early as possible to i) determine the significance of adverse impacts; ii) identify the level of assessment and institutional resources required; iii) determine disclosure requirements (para. 50).
- Information disclosure: In line with the ADB's Public Communications Policy, the Policy requires (para. 53) that for environment Category A projects, draft environmental impact assessments must be posted on the ADB's website 120 days before project approval. For draft environmental assessment and review frameworks, draft resettlement frameworks and/or plans and draft Indigenous Peoples planning frameworks and/or plans, the Policy only stipulates that these documents must be provided by the borrower/ client and posted on ADB's website before project appraisal, as follows: i) final or updated environmental impact assessments and/or initial environmental examinations, resettlement plans, and Indigenous Peoples plans upon receipt (by the ADB), and ii) environment, involuntary resettlement and Indigenous Peoples monitoring reports submitted by borrowers/clients during project implementation upon receipt (by the ADB).
- Consultation and participation: The general provisions on consultation and participation are mostly phrased as aspirations. The Policy states that the ADB "is committed to working with borrowers/ clients to put processes of meaningful consultation and participation in place." Meaningful participation is defined as: i) beginning early in the project preparation stage and being carried out on an ongoing basis throughout the project cycle; ii) providing timely disclosure of relevant and adequate information that is accessible to affected people; iii) being free of intimidation and coercion; iv) being gender inclusive and responsive; and v) enabling the incorporation of all relevant views of affected people and other stakeholders in decision-making (para. 54).
- Due diligence and review of safeguard assessments and plans: Due diligence refers to the ADB's process of assessing safeguard issues through field visits and desk reviews as well as through examining relevant safeguard documents (such as environmental impact assessments, resettlement plans, Indigenous Peoples' plans). Through its due diligence processes, the ADB confirms that all potential environmental and social risks are identified. If they cannot be avoided, it ensures that appropriate mitigation measures are identified (SPS, para. 56).
- Monitoring and reporting: The monitoring obligations are merely required to be "commensurate with the project's risks and impacts". For highly complex and sensitive projects, the ADB requires the borrower/client to "engage an independent advisory panel" (SPS, para. 57).
- Local grievance redress mechanisms: The Policy requires the borrower/client to set up and maintain a grievance redress mechanism at project level (SPS, para. 59). This mechanism does not replace the ADB's accountability mechanism, but is intended to solve grievances at the local level. Affected

people can also take complaints to the ADB's Accountability Mechanism. The Accountability Mechanism Policy merely requires complainants to demonstrate that they have sought to address their complaint with management.

2.2.2 ENVIRONMENTAL REQUIREMENTS

More precisely as environment aspects are concerned, the objective of the Policy is to "ensure the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision-making process" (SPS, p. 17). The main Environmental Safeguard requirements are the followings:

- **Categorization and information disclosure:** The Policy uses a categorization system to reflect the significance of a project's potential environmental impacts. "A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence" (SPS, para. 50). Final or updated EIAs and/or initial environmental examinations must be made available upon receipt on the ADB's website. The following categories exist:
  - **Category A**: significant adverse environmental impacts that are irreversible, diverse or unprecedented. Category A projects requires a full-scale Environmental Impact Assessment (EIA). A draft EIA, including the Environmental Management Plan, must be made available on the ADB's website at least 120 days prior to Board approval.
  - **Category B**: less adverse environmental impacts that are site specific, few of which are irreversible, and mitigation measures that can be designed more readily than for Category A projects. Category B projects require an initial environmental evaluation.
  - **Category C**: minimal or no adverse environmental impacts. Category C projects require further environmental assessment actions/documents.
  - **Category FI**: projects involving ADB funds to, or through, a financial intermediary. Category FI projects require an Environmental and Social Management System.
- **Assessment process:** Environmental impacts must be determined in consultation with affected people and concerned non-government organizations (NGOs). For category A projects, the borrower/client is required to undertake an assessment of options that looks at alternatives to the project's location, design, technology and components. The options assessment will also examine the "no project" alternative. The borrower/client must present the rationale for selecting the particular project details, including a cost-benefit analysis that takes into account environmental costs and benefits of the various alternatives considered (SPS, Appendix 1, para. 4).
- **Type of impacts:** The types of impacts related to the environment include physical, biological, cultural and socioeconomic impacts. These can relate to occupational health and safety; community health and safety; vulnerable groups; gender issues; and impacts on livelihoods and physical cultural resources (SPS, Appendix 1, para. 5).
- **Project site/scope:** The project site covered by the environmental safeguard provisions in the Policy is defined as: "the primary project site(s)

and related facilities that the borrower/client (including its contractors) develops or controls, such as power transmission corridors, pipelines, canals, tunnels, access roads, borrow pits and disposal areas, and construction camps". This definition also includes: associated facilities that are not funded as part of the project, but "whose viability and existence depends exclusively on the project"; "areas and communities potentially affected by cumulative impacts from further planned development of the project"; and predictable impacts caused by the project "that may occur later or at a different location" (SPS, Appendix 1, para. 6).

- **Transboundary impacts:** The environmental assessment process must identify potential transboundary effects, such as air pollution and increased use or contamination of international waterways. It must also identify global impacts, such as the impact of greenhouse gases and impacts on endangered species and habitats (SPS, Appendix 1, para. 7).
- **Environmental planning and management:** If environmental impacts are identified, the borrower/ client is required to prepare an environmental management plan describing how potential impacts and risks will be addressed (SPS, Appendix 1, para. 12).
- **Consultation and participation, grievance mechanism:** The consultation process and grievance mechanism process follows the same provisions as laid out in the general requirements (see above) (SPS, Appendix 1, paras. 19 and 20).
- **Reporting and monitoring:** The Policy states that "the extent of monitoring activities will be commensurate with the project's risks and impacts" (SPS, Appendix 1, para. 21). For Category A projects, the borrower/client is required to retain qualified external experts or qualified NGOs to verify its monitoring information. The minimum requirement is semi-annual report during construction for projects with significant impacts and which become annual during operation. For other projects, periodic reports are required.Monitoring reports must be posted in a location accessible to the public (SPS, Appendix 1, paras. 21 & 22).
- **Unanticipated environmental impacts:** If unanticipated impacts occur during project implementation, the borrower/client is required to update the environmental assessment and environmental management plan or prepare a new assessment and plan (SPS, Appendix 1, para. 23).
- **Biodiversity conservation and sustainable natural resource management:** This section (SPS, Appendix 1, paras. 24 – 49) contains requirements regarding the following issues: modified habitats; natural habitats; critical habitats; legally protected areas; invasive alien species; management and use of renewable resources;
- **Pollution prevention and abatement** (resource conservation, energy efficiency, waste, hazardous materials, pesticide use and management, greenhouse gas emissions);
- **Health and safety** (occupational health and safety and community health and safety); and
- **Physical cultural resources** (SPS, Appendix 1, para. 24).

3 PROJECT DESCRIPTION

3.1 Solid Waste Components

Solid waste management in Myanmar is in generally inadequate, with limited collection services and poor final disposal. Uncollected waste is usually burned or dumped into roadside drains and rivers, which is causing environmental pollution and urban floods. Such urban environment contaminates the productive capacity of a city making them less competitive and liveable.

3.1.1 REQUIREMENT

Solid waste disposal is presently a critical issue in the Project Towns. The existing dump sites in both towns are putting at risk surface and groundwater quality. Also smoke and toxic gasses from uncontrolled burning of the waste are a threat for public health.

Whatever the project components considered, mainly beneficial impacts will result from any improvement. Even if proposed new landfills do not include all the good practices measures and technologies observed in industrialized countries, for evident budget limitation reasons, potential detrimental impacts can be significantly avoided or minimized by appropriate location and design of the facility.

HPA AN

The population is expected to grow from 75 141 in 2015 to 143 936 in 2040. This is a growth rate of 2.5% per year.

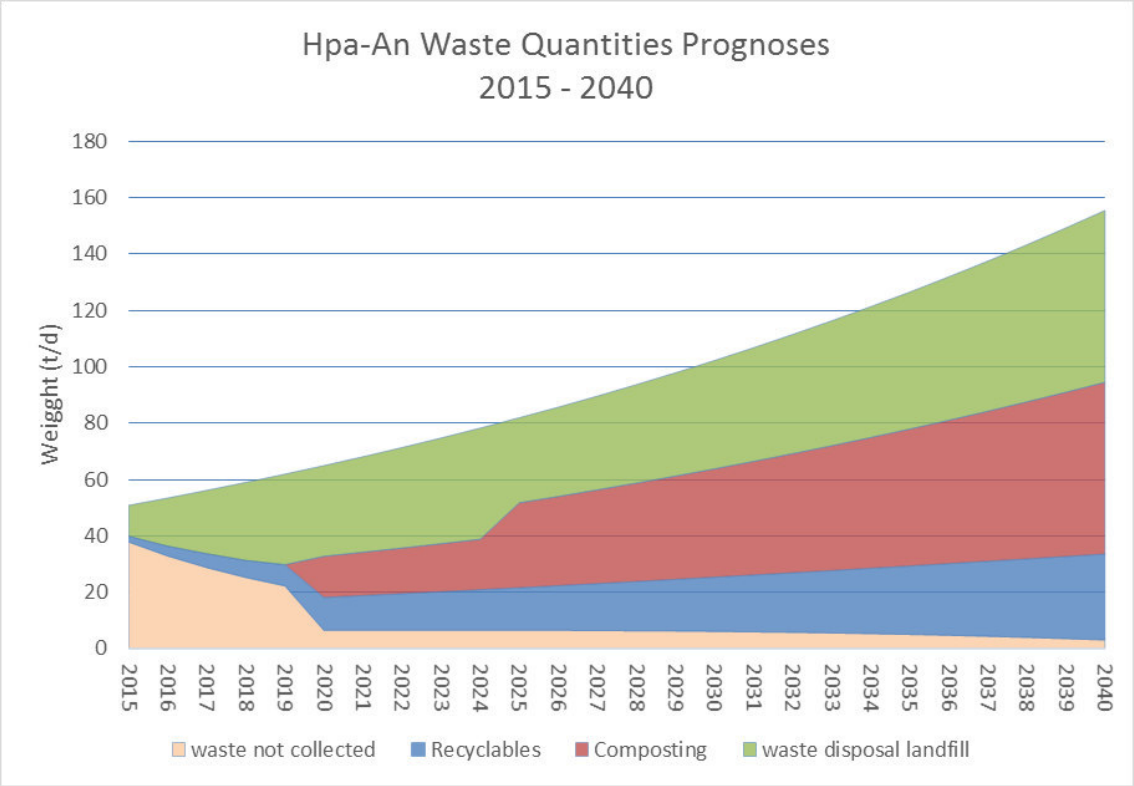
The more population, the more total waste is generated. Also due to higher income per household, more waste per capita is generated. Waste production per capita is anticipated to increase from 0.55 kg/cap/day in 2015 to 0.90 kg/cap/day in 2040. Waste generated at markets, small businesses and offices contribute to about 20% of household waste generation.

It is also anticipated a decrease of illegal dumping, with uncollected waste decreasing from 74% in 2015 to 8% in 2020 and 2% in 2040. Recyclable waste is estimated to represent at present about 20% of the collected waste.

As biodegradable waste represents about 58-60% of the generated waste, the project will consider the opportunity for composting, which will strongly increase the recycling level of the generated waste and extend the life of the landfill. A small composting plant is proposed for implementation in 2019, with experimentation and training in 2020 prior to start from 2021 till 2025 with the treatment of 25% of the waste generated to produce compost. From 2026, plant capacity will be increased to compost 40% of the waste generated.

After the recyclables are taken out (20% of waste collected), and after the biodegradable waste is converted to compost (25% first 5 years and 40% the following years), a relative small fraction remains for landfilling. The graph in the following Figure shows the quantities (in tonnes per day) with separation of recyclables and biodegradable waste from the total waste generated for the next 25 years.

Figure [2] CURRENT AND FUTURE WASTE GENERATION AND TREATMENT IN HPA-AN



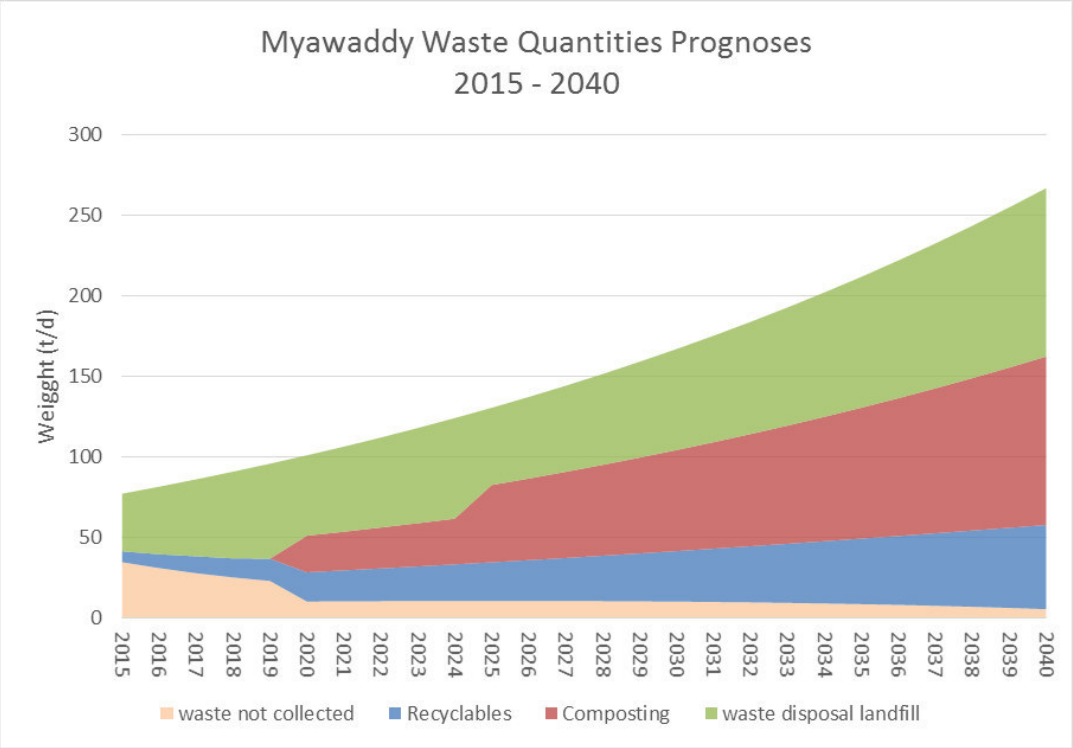
MYAWADDY

The population growth is anticipated from 113 155 in 2015 to 246 844 in 2040, or a growth rate of 3% per year.

The same assumption are used for Hpa-An and Myawaddy regarding evolution of waste generation per capita, evolution of markets wastes generation, evolution of recycling and composting. In this projection, a decrease of uncollected waste is anticipated from 45% in 2015 to 8% in 2020 and 2% in 2040.

The graph in following Figure shows the quantities (in tonnes per day) with separation of recyclables and biodegradable waste from the total waste generated for the next 25 years.

Figure [3] CURRENT AND FUTURE WASTE GENERATION AND TREATMENT IN MYAWADDY



3.1.2 PRELIMINARY DESIGN

The preliminary design consists of the following sections:

- Collection Strategy
- Recycling improvement
- Composting
- Controlled Landfill

3.1.2.1 Collection Strategy in Hpa An and Myawaddy

An economic analysis of options with or without transfer station carried out under the PPTA study leads to the conclusion that transfer station is not economically justified at least on a medium term. The project considers the acquisition of 2 small dumpers and 2 large dumpers in Hpa-An and acquisition of 2 small dumpers and one large dumper in Myawaddy, to cover the needs for the first phase until 2025. The number of trucks is based on the first phase implementation phase Short Term till 2025 and shall be increased according to needs on a longer term.

Improvement of the primary collection consists of the following elements:

Table [6] IMPROVEMENT PRIMARY COLLECTION

Item	Description	Subdivision	Hpa-An No. to purchase	Myawaddy No. to purchase
i)	Small containers 240 ltr in 3 different colours for the three different separation waste streams	a. Green colour containers for organics; b. Blue colour containers for recyclables c. Yellow colour containers for the reject waste	18 18 18	10 10 10
ii)	Aluminium containers 1100 ltr for siting at small size collection points. Two different containers for separating organics and rejected waste. It is assumed that most of the recyclables are already removed by the informal sector	a. Aluminium container with large text on site: ORGANICS b. Aluminium container with large text: ONLY REJECTS WASTE	15 15	13 13
iii)	Transport containers 3 m3 for collecting with hooklift trucks	a. Steel containers hook-lift system	9	5
iv)	Collection trucks for above containers	a. Small truck with lift system for 240 ltr and 1100 ltr containers b. Hook lift Truck for 3m3 steel containers	2 2	2 1

It is obvious when the new waste management systems will be fully implemented, more trucks are required. This is assumed to take place in the next Phase, Medium Term 2025 -2030.

3.1.2.2 Recycling

To improve the informal collection sector, awareness campaigns, information how to deal with recyclable collection in a safe and healthy manner through meetings and information leaflets will be provided to the concerned sector and the public.

To improve the recyclable collection rate from present 16% to about 20%, more involvement of the formal sector is required. More collection will be implemented throughout the following measures:

Table [7] IMPROVEMENT MEASURES FOR RECYCLING

Item	Description	Subdivision	Hpa-An	Myawaddy
i)	Formal sector: Introducing at schools, township offices and other official buildings separation and recovery of recyclables using 3 different colour containers	a) recyclables ("dry waste"): 240 ltr containers Blue	9	5
		b) compost ("wet waste"): 240 ltr containers Green	9	5
		c) reject waste: 240 ltr containers Yellow	9	5
ii)	Extra collection containers 1100 l dedicated to recycling	Recycling: 1100 l metallic container	9	5
iii)	Transport containers 3 m3 for collecting with hooklift trucks	Steel container hooklift system	5	3

3.1.2.3 Composting

Two proposed systems will be introduced in the cities:

- Backyard Composting;
- Construction of a Composting Plant.

BACKYARD COMPOSTING

Backyard composting will be only introduced in the suburban areas of the cities and for houses with large gardens. Training and information is required to assist the potential house owners with backyard composting. In this project it is estimated to implement "Instruction and Awareness Programs for Backyard composting"; this program may be executed in conjunction with the recyclables awareness programs.

CONSTRUCTION OF COMPOST PLANTS

The following assessment concerns only the first Phase for composting 25% of the generated waste till 2025. The following phase (composting 40% of the waste generated) is not analysed in terms of capex/opex, however, future land requirements are considered in the selection of sites. Compost plants will be located on the landfill sites. Composting Plants include the following facilities:

- Construction of Sorting Area: concrete pad with drainage
- Construction composting Pad, concrete pad with drainage system
- Construction of monsoon cover over composting area: hangar style roof
- Construction of maturing area, concrete pad
- Construction of storage area for ready compost: concrete based area with hangar style roof
- Office, sanitation building.
- Equipment to be purchased:
- Front-end loader: 1
- Trommel screen, capacity max.15 tons/hour: 1

- Conveyor belts different lengths and width: 5
- Magnetic Ferro remover: 1
- Mixer and Grinder, max capacity 15 tons/hour: 1
- Final automatic screens <10mm

The required area for each compost plant is 0.41 ha for Hpa-An and 0.61 ha for Myawaddy.

3.1.2.4 Controlled Landfills

WASTE QUANTITIES

Design criteria for the landfills in both cities are presented below and landfill requirements are presented in following table. Lifespan projections are 2040.

- Population growth from 2015 to 2040;
- Quantity per capita from 0.55 kg/c/day in 2015 to 0.9 kg/c/day in 2040;
- Separation rates for composting fractions of 25% of collected waste in 2020 to 40% of collected waste starting from 2026;
- Recyclables recovery rate from approx. 16% of collected waste in 2015 to 20% of collected waste in 2020;
- Collection of generated waste from 55% in 2015 to 95% in 2021 and finally to 98% in 2040.
- The total rejects waste to be landfilled after the separation of the recyclables and organics from the generated waste is 363,000 tonnes for Hpa-An and 616,900 tonnes for Myawaddy during the lifespan of the landfill in 2040.

LANDFILL AREA AND LANDFILL CELLS

Table [8] TOTAL LANDFILL DISPOSAL AREA AND LANDFILL CELL I AREA

Landfill Item	Unit	Hpa An	Myawaddy
Total Capacity LF 2040*	m^3	601770	996970
Average height	m	10	10
Area for landfill waste	m^2	60177	99697
Calculated area (trapezium shape)	m^2	65000	103500
Infrastructures (roads, offices etc.): 15%	m^2	9750	15525
Total m^2	m^2	74750	119025
Total ha. (/10,000m2)	ha	7.5	11.9
Total in acres (2.4691m2)	acres	18.5	29.4
First CELL I			
Total number of Cells	No.	3	4
Percentage landfilled in Cell I	%	33	25
Quantity waste in Cell I	m^3	200 000	247 500
Area required Cell I:	m^2	22 000	27 000
Cell I in ha.	ha	2.2	2.7

Landfill Item	Unit	Hpa An	Myawaddy
Cell I in acres	acres	5.4	6.7

Note: * Including cover material and provision for old waste of 100 000 m3 for Hpa An and 150 000 m3 for Myawaddy.

LOCATION OF LANDFILLS IN HPA-AN AND MYAWADDY WITH A 500 M BUFFER ZONE

The proposed area for the composting plant and sanitary landfill in Hpa-An is located at the Northern side of the future industrial zone extension. The wide area is recovering from recent vegetation clearing. Land is owned by the State Government, is presently unused and devoid of any built-up structures within a distance of 500 m around the site. Access road from the future IZ extension already exists.

Figure [4] HPA-AN PROPOSED LANDFILL LOCATION

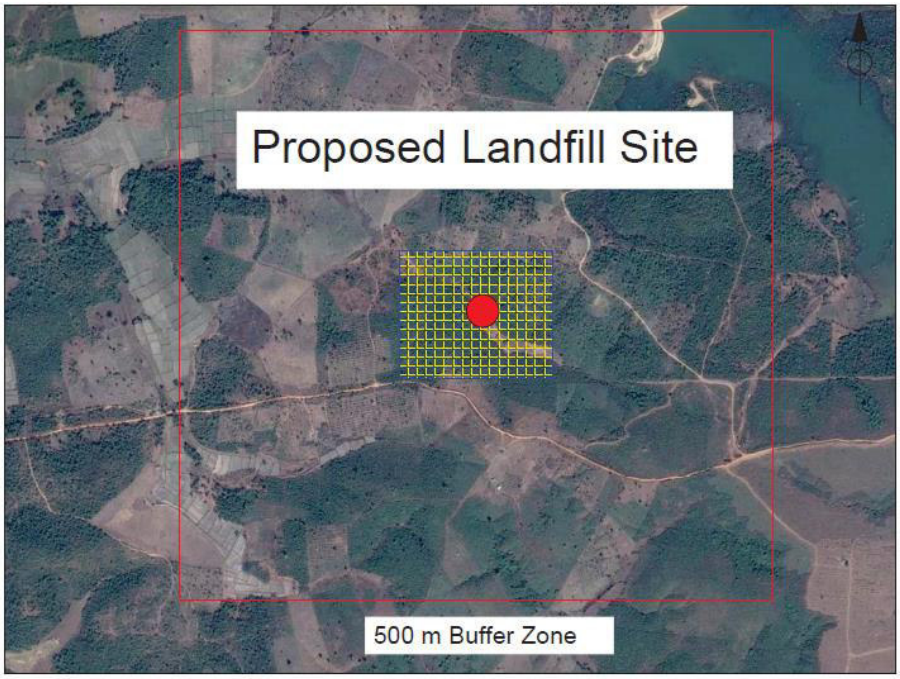
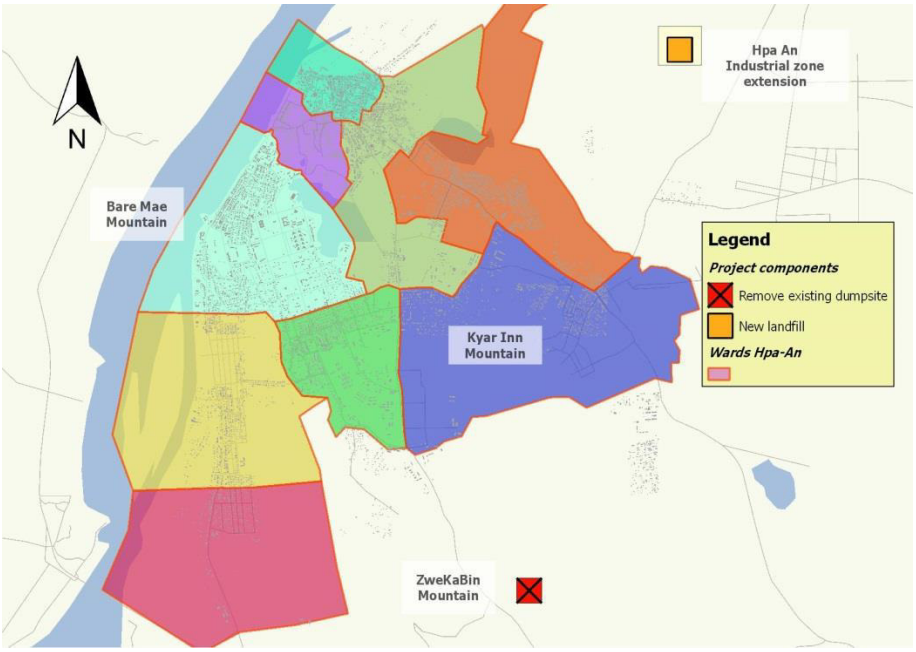


Figure [5] HPA-AN PROPOSED LANDFILL LOCATION AND DUMP SITE CLOSURE



The proposed site for Myawaddy landfill is presently owned by the Township Development Affairs within the Trade Zone. The total area secured for the long term development of the trade zone is 270 hectares (668 acres). The site presents scrub vegetation on its slopes and some common trees. With the exception of a warehouse located at 400 m from the site, no other buildings are located within 500 m around the site.

Figure [6] MYAWADDY PROPOSED LANDFILL LOCATION

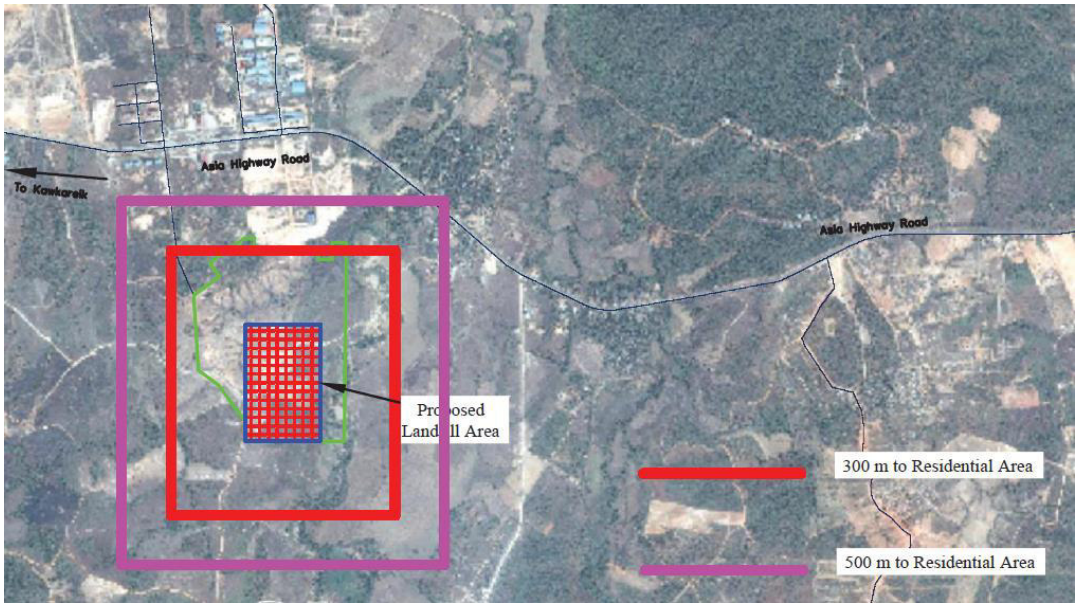
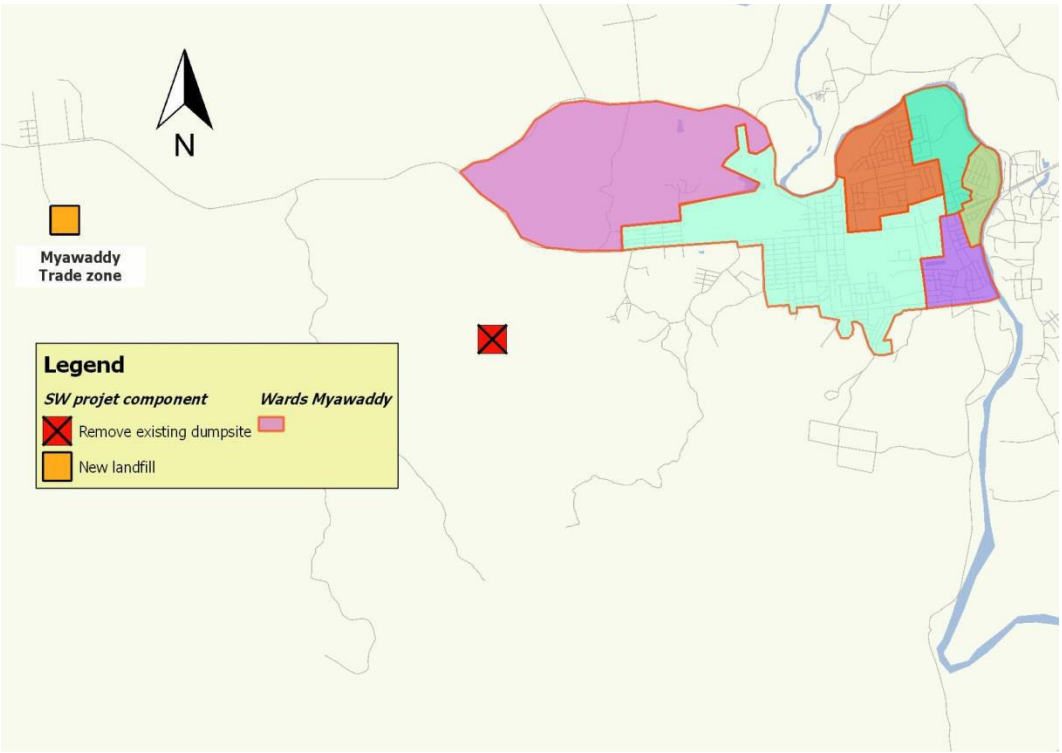


Figure [7] MYAWADDY PROPOSED LANDFILL LOCATION AND DUMP SITE CLOSURE



LEACHATE TREATMENT

Leachate treatment in this project is based on:

- Recirculation back into the landfill;
- Passive evaporation to the atmosphere (often through holding ponds or storage lagoons)
- On-site physical and biological treatment, a simple treatment unit with physical treatment (sedimentation, settling pond) and biological treatment (oxidation pond) is considered.

Hpa an: landfill cell area for waste landfilling in Cell 1 is 2.2 ha. Each cell will be split into hydraulically independent sub-cells to reduce the operated surface and then to reduce the leachates. A common practice is to operate with 6 months to 1 year lifespan sub-cell.

It would mean 5 000 m² of opened surface. As yearly rainfall in Hpa-An reaches 4,400 mm, there would be about 22,000 m^3 of leachate to be treated every year.

Simulation on a monthly basis leads to the conclusion that, for an annual rainfall of 4 400mm with 2 280 mm/year evaporation, 3 000 m² leachate pond by 3 m deep would allow for a simple evaporation process in dry season combined with a constant average treatment of 60 m^3/d.

Three landfill cells will be required for Hpa-An, respectively built in 2019/2020, 2027 and 2034. Only the first cell is considered for the present first phase of the project.

Myawaddy: landfill cell area for Cell 1 is 2.7 ha. Each cell should be split into hydraulically independent sub-cells to reduce the operated surface and then to reduce the leachates. It would mean 5,400 m² of opened surface. As yearly rainfall in Myawaddy reaches 1 800 mm, there would be about 9,800 m^3 of leachate to be

treated every year. About 4 300 m² basin with 2m depth (to store the peak flow in June/July/August) should be required to evaporate the leachate. The proposed option includes a series of 5 covered basins each of 1 000 m² and 2 m depth.

Four landfill cells will be required in Myawaddy, to be built respectively in 2019/2020, 2025, 2030 and 2035. Only the first cell is financed under the first phase of the project.

3.1.2.5 Closure of Old dumpsites

HPA-AN OLD DUMPSITE

When the new landfill site is active and as upgrading of the existing dumpsite is not possible as it too small for possible extension, the old dumpsite near ZweKabin Mountain must be rehabilitated. Two options have been considered:

- Coverage of the existing dumpsite with a HDPE liner, protection layer and top soil cover of 0.5 m with planting of grass and bushes;
- Removal of the existing dumped waste and transport to the new landfill, Restoring the area with topsoil and vegetation.

Coverage of the existing dumpsite has been considered as the best option for practical and mainly economic reasons considering the area of 25 000 m².

MYAWADDY OLD DUMPSITES

The two dumpsites in Myawaddy along the river side were closed in December 2015 and are presently under rehabilitation by Myawaddy Municipality. From December 2015 onwards, another temporary dumpsite has been created along HW1. As soon as the new controlled landfill starts operation, all the already dumped waste will be removed from this temporary dumpsite and transported to the new constructed landfill.

Proposed works will include (i) the removal of the disposed waste (estimated to be about 90,000 m3 by the end of 2020) and (ii) the restoration and revegetation of the area (20,000 m²).

3.2 Water Supply Components

3.2.1 PROJECT OBJECTIVES

The proposed project intends to improve the water supply system in Hpa-An and Myawaddy, with the following objectives:

Improve knowledge of the system by implementing monitoring and new practices:

Reduce and control level of NRW;

improve water production in both quantity and quality;

Increase water supply coverage to cope with future city development;

Improve water distribution achieving continuous water supply and enhancing pressure management;

Promote asset management and long term strategy of the system with assessment of long term requirements;

Secure the overall system, increasing its resilience and sustainability.

3.2.2 PROJECT STRATEGY

The water supply project of the two Kayin cities meets the following targets:

3.2.2.1 Increase water supply coverage and duration

In Hpa-An, the objective is to connect 70% of the urban population (9 urban wards) in the short term by the end of the project, and to reach 95% coverage in long term (2040). This means by 2020 nearly 75 000 inhabitants connected (increase of 68 000 persons from present situation) with 12 800 new connections, and by 2040 over 136 500 inhabitants connected.

In Myawaddy, the objective is to connect 70% of the urban population by the end of the project and to reach 95% coverage in long term (2040). By 2020 nearly 75 000 new inhabitants connected through 15 000 new connections, and by 2040 over 158 000 inhabitants connected.

In both cities, the level of service is unequal and some areas are supplied only few hours per day or do not have access to piped water at all. The target is to achieve a permanent water service, 24h/d and 7d/week together with an appropriate monitoring system.

3.2.2.2 Reduce Non-Revenue Water (NRW)

Reduction and control of NRW through the definition and application of an action plan for each city is also required to reach a suitable quality of services. It will also have an impact on the financial sustainability of the systems limiting expenditures (CAPEX and OPEX) and increasing incomes.

3.2.2.3 Improve Supplied Water Quality

The project aims also to ensure good water quality from production to consumer taps. Using existing assets and available resources, water will be treated before being distributed. Treated water will comply with WHO and national quality standards. The table below shows objectives on treated water quality.

Table [9] WATER QUALITY OBJECTIVES

Parameters	National drinking water standard	WHO drinking water standard	Treatment objectives
Turbidity	5 NFU	< 5 NFU**	1 NFU
pH	6.5 - 8.5	6.5 - 9.5	6.5 - 8.5
Iron	1 mg/l	0,3 mg/l**	0.2 mg/l
Aluminium	-	0.2 mg/l	0.2 mg/l
Ammonia	0.02 mg/l	-	0.1 mg/l
Chlorine	2 - 10 mg/l	-	1 - 2 mg/l
E. Coli	-	0 (99%)**	0 /100 ml
Parasites*	-	-	0 /100 ml

* Gardia and Cryptosporidium ** Expected

3.2.3 PROPOSED PROJECT FOR HPA-AN

In line with previous objectives and strategy the proposed project consists of four major elements as described below:

- Production and treatment
- Increase and secure storage
- Expand distribution system
- Reduce NRW, improved Operation & Management covering asset management, GIS, billing and customer management.

3.2.3.1 Water Intake

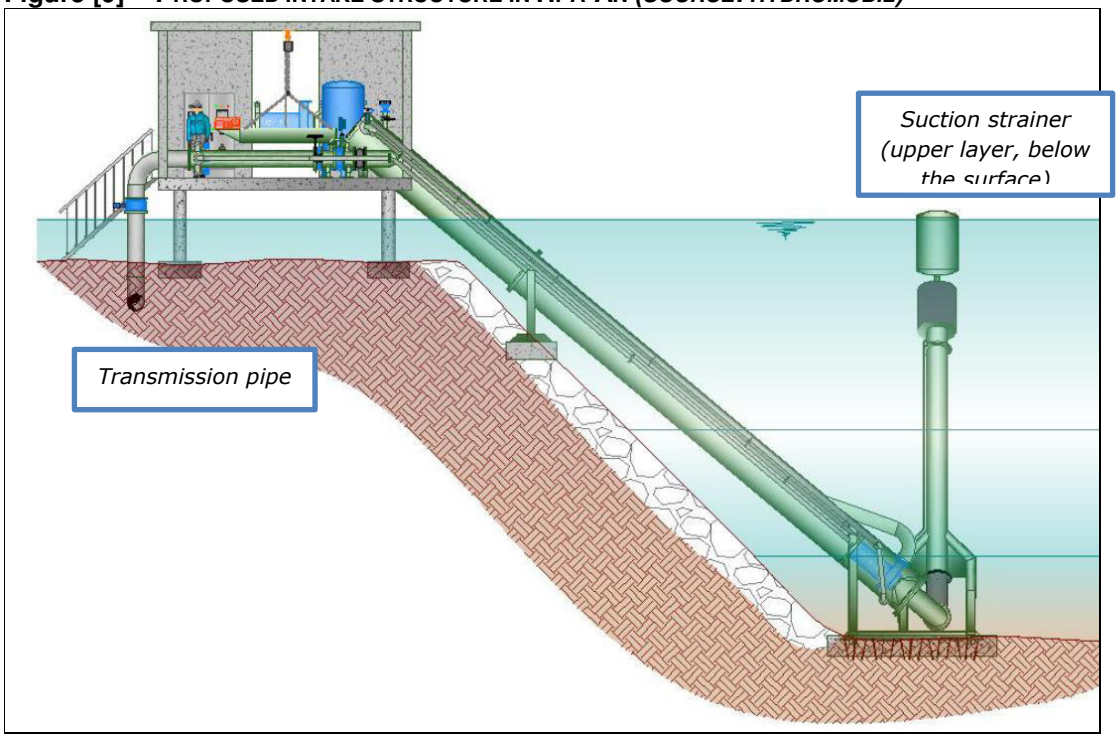
The project will create a new intake structure to abstract water from the Thanlwin River. The selected site is located on the river bank, north of the city and upstream the main waste water discharges to the river. The area belongs to HTDC and is currently used by an existing small floating pumping station (see figure below). Consequently, intake will be replaced with a new main system, using the existing building to be rehabilitated.

Proposed solution consists in a permanent structure with an anchored transfer mast equipped with a mobile pump inside together with a floating structure. . To adapt to water level variation, an oscillating and floating mast equipped with a suction strainer (ensuring a filtration of 500µm) is proposed to abstract water from the upper layer. This technique enables to abstract from the most appropriate water layer regardless the water level: just below the surface to avoid floating pollutants (oil…) and where turbidity is reduced compared to lower layers. Electrical and mechanical equipment are installed inside the existing building on the shore above high water mark.

Figure [8] WATER INTAKE SITE IN HPA-AN (KUSEIK INTAKE)

With an initial capacity of 650m3/h, this facility could be easily extended in future to cope with long term requirements, and will ensure a reliable water abstraction and transfer to the water treatment plant. Conceptual drawing of the intake structure is presented below.

Figure [9] PROPOSED INTAKE STRUCTURE IN HPA-AN *(SOURCE: HYDROMOBIL)*



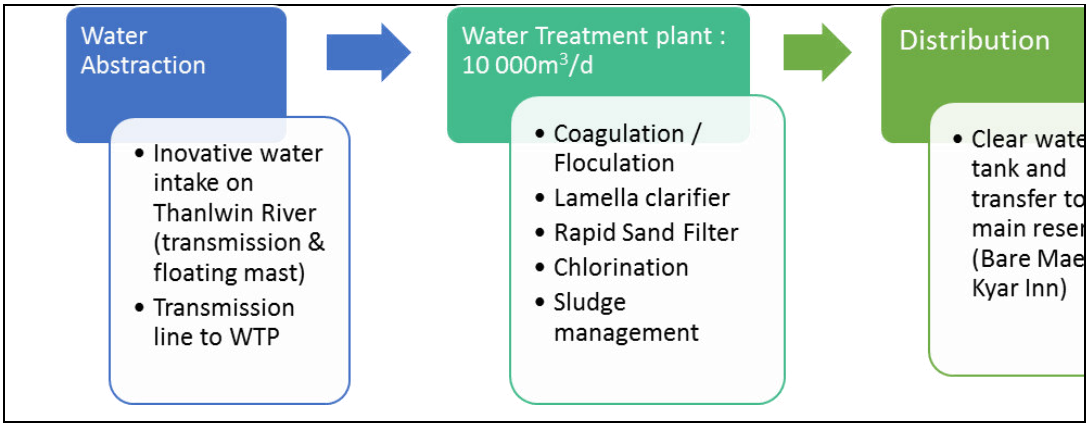
3.2.3.2 Treatment Plant

Land pressure is high in Hpa-An, and identification of suitable and available land for the treatment plant was very difficult. A land plot has been identified near KhanThaYar Urban Lake. Land requirement for the construction of the treatment plant together with future extension is estimated to be 1 acre (nearly 4 500 m²). The picture below shows the proposed area.

Figure [10] PROPOSED WTP AREA IN HPA-AN

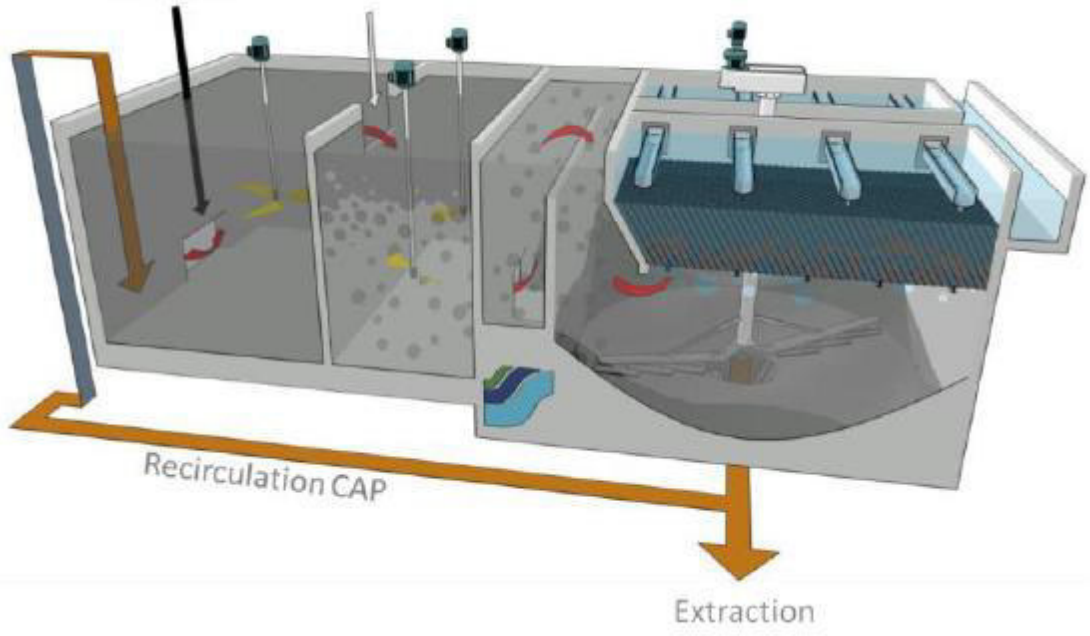
The new water treatment plant will have a nominal capacity of 10 000m^3/d (corresponding to 650m^3/h).This capacity will satisfy the needs on the basis of 15h/day operation. Daily capacity could be increased if necessary in order to supply the maximum daily need for the project horizon in 2025 of nearly 13 000 m^3/d under a 20h/d operation (maximum operation time considering regular washings).

Overall functioning is summarized below:



The first stage of the treatment is a clarification on lamella clarifiers where settling is increased by coagulation and flocculation. The clarification shall be split into 2 identical parallel lines. A first coagulation stage is required for which chemical would be added and mixed with the raw water in a specific tank (12m^3/line). Coagulant will be alum or PAC which can be supplied in powder or granular form. Then, flocculation is performed in an additional area (60m^3/line) by adding and mixing polymer. Settling will occur in clarifier (25m^3/line) for which standard clarifier with lamella is proposed to optimize the space. Particles will then settle and generate sludge at the bottom to be collected. Different variants of patented clarifiers exist and an example is presented in the figure below.

Figure [11] TYPICAL CLARIFIER



Filtration step includes a battery of 4 open type gravity sand filters, with the associated backwash, air scour and control facilities. Filters are upstream and constant level type and each of them will be equipped with one independent filter control system (easier operation). Using rapid sand filters, depth of sand

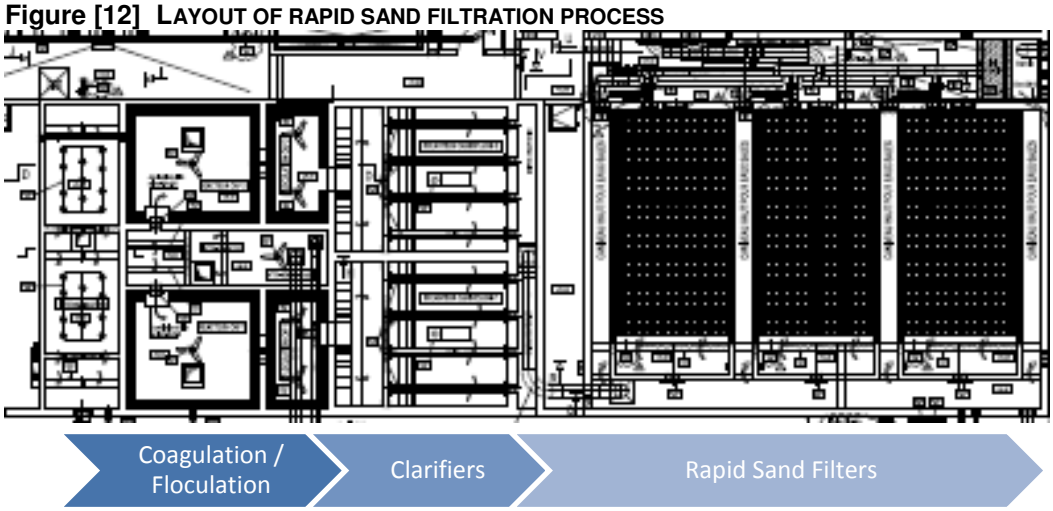
shall not be less than 0.9 m (exclusive of all supporting layers). An overall filtration surface of nearly 80m² would be necessary (4 x 20m²).

Chlorination for disinfection will be performed into a clear water tank prior to distribution. Treated water will be stored on site (1000m^3 storage tank) and supplied with transmission to the main storages of Bare Mae and Kyar Inn using a booster pumping station.

The new facility will also include: operation building, electricity building, chlorination plant, air production. A SCADA system shall also be installed to assist the operation of the plant and centralized the data and monitoring. In addition, sludge resulting from filters washing will have to be properly disposed. Due to the volume of sludge which is expected in connection with a seasonal high turbidity of the Thanlwyn, a thickener will be installed to reduce the volume prior to disposal.

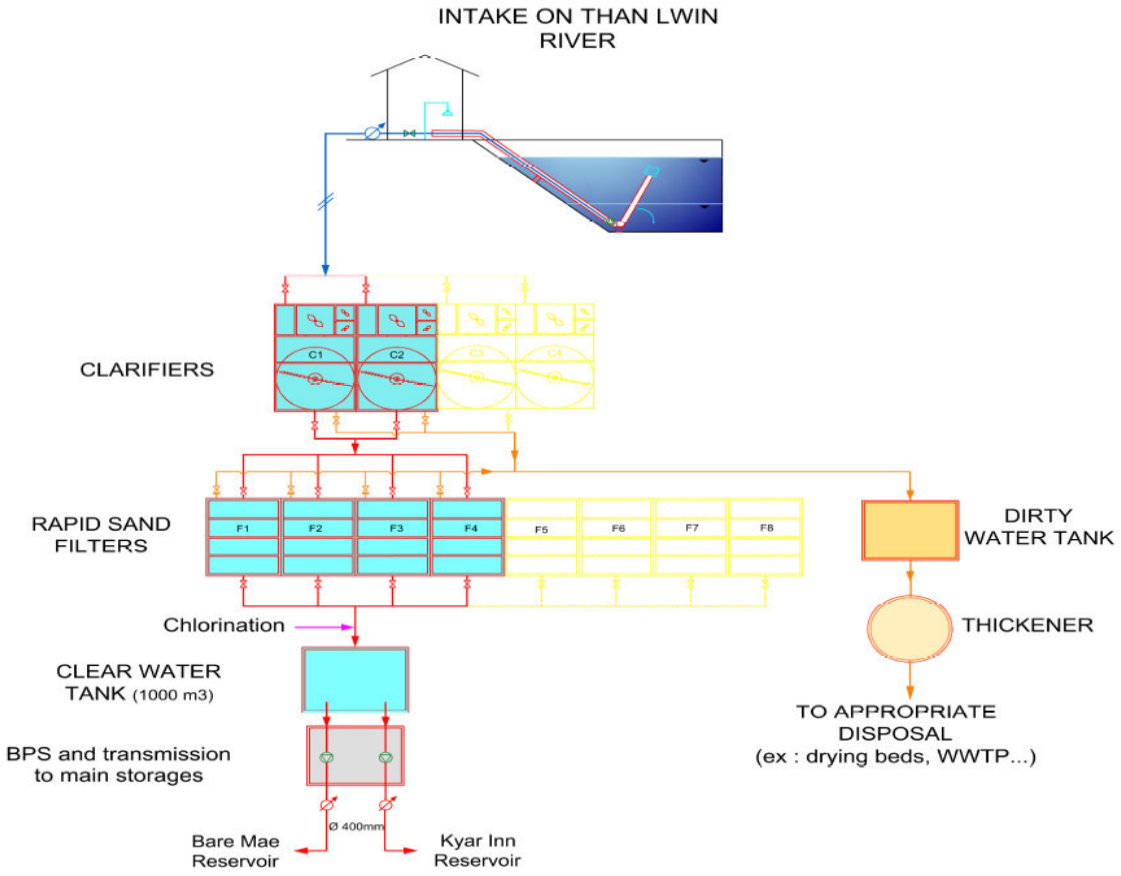
The figure below presents a general layout of the rapid sand filtration system representing the different steps of the treatment: chemical dosing, coagulation/flocculation, clarifier and rapid sand filters. This example presents 2 clarification lines and 3 filters.

Figure [12] LAYOUT OF RAPID SAND FILTRATION PROCESS



The treatment plant would have an initial capacity of 10,000 m3/day (to be financed under this project) with the possibility to expand to 18,000 m3/day in a second phase to cope with long term requirements. The system would include a permanent intake structure innovative and adapted to the site, followed by the treatment process: coagulation/flocculation/clarifier, rapid sand filtration, and disinfection as illustrated below.

Figure [13] DESCRIPTION OF HPA-AN WATER TREATMENT PLANT



3.2.3.3 Storage

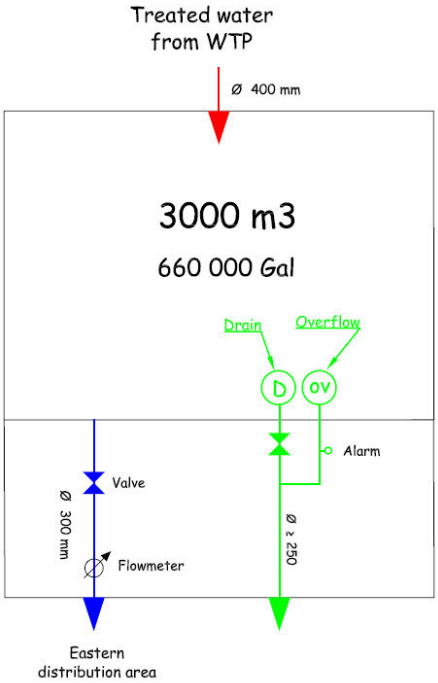
Treated water storage considers two main storages, in the eastern and western parts of the city, each with specific distribution areas.

Construction of a new reservoir for the Eastern area of the city with capacity of 3 000 m^3 (i.e. 0.66 Mgal), sufficient to cover half-day autonomy and ensure the good functioning of the system under gravity conditions and supply the peak demand. This facility is to be constructed on Kyar Inn Mountain where an area has been identified with a suitable elevation (nearly 50m) to enhance gravity flow. Site is a former earth reservoir developed by a nearby monastery and no more utilised. The figure below presents the proposed site and general scheme of the facility.

Figure [14] SITE IDENTIFICATION AND GENERAL SCHEME OF KYAR INN STORAGE

Site location (0.5acre) and view of existing pond

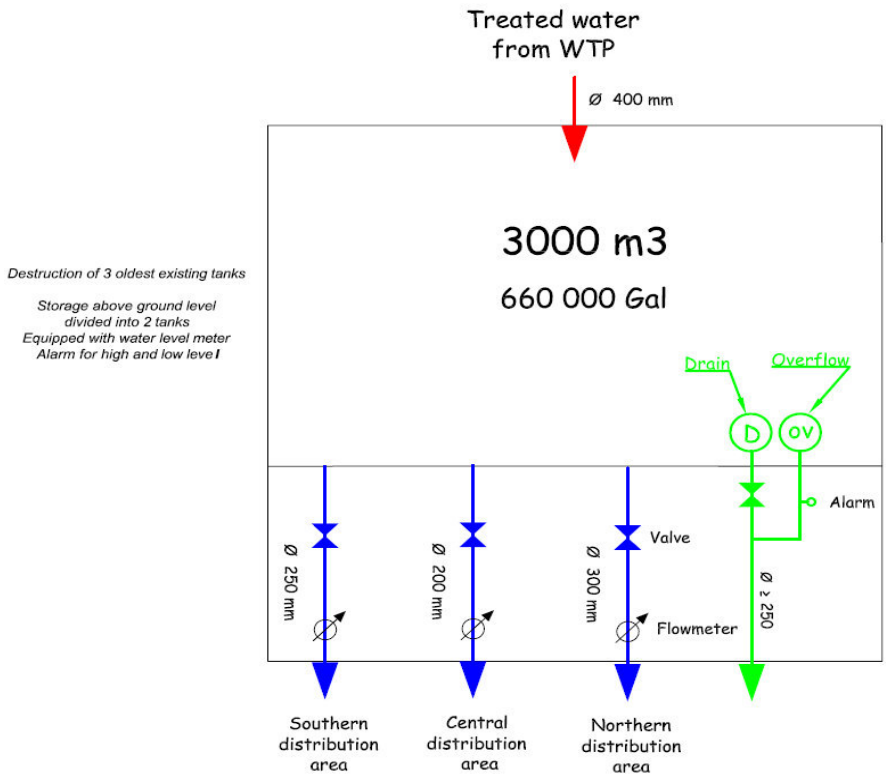
Storage divided into 2 tanks
Equipped with water level meter
Alarm for high and low level
To be doubled in long term



Rehabilitation and improvement of Bare Mae reservoir for the Western part of the city: Decommissioning of the 4 existing reservoirs and creation of a main infrastructure is suggested. Indeed, creation of key storage at this location with sufficient capacity (not less than 3 000m3) is highly strategic. Due to limited space, the demolition of the existing reservoirs is required to provide area for construction of the new reservoir.

Each reservoir will be equipped with overflow and drain system (for regular emptying and cleaning) as well as water level meter and sensors (low and high level). Measurements and data will be sent to the SCADA system and control room located at the treatment plant site.

Figure [15] EXISTING VIEW AND GENERAL SCHEME OF BARE MAE STORAGE



3.2.3.4 Distribution

Transmission and main distribution includes the new transmission line between water intake and treatment plant, the transmission lines between treatment plant and storages of Bare Mae and Kyar Inn Mountain (400 mm) and the main distribution lines (200-300 mm) from the two storages to the 9 wards.

Table [10] LENGTH OF TRANSMISSION AND MAIN DISTRIBUTION LINES FOR HPA-AN

	200 mm	250 mm	300 mm	400 mm	500mm	TOTAL
Length (m)	8 780	3 040	3 270	3 920	2 450	**21 460**

Internal distribution: The length of internal network to be installed by 2025 is estimated to be nearly 80km, in addition of existing distribution network (~32km) among which many pipes will need to be changed. Expected breakdown of pipe length per diameter for Hpa-An is detailed below:

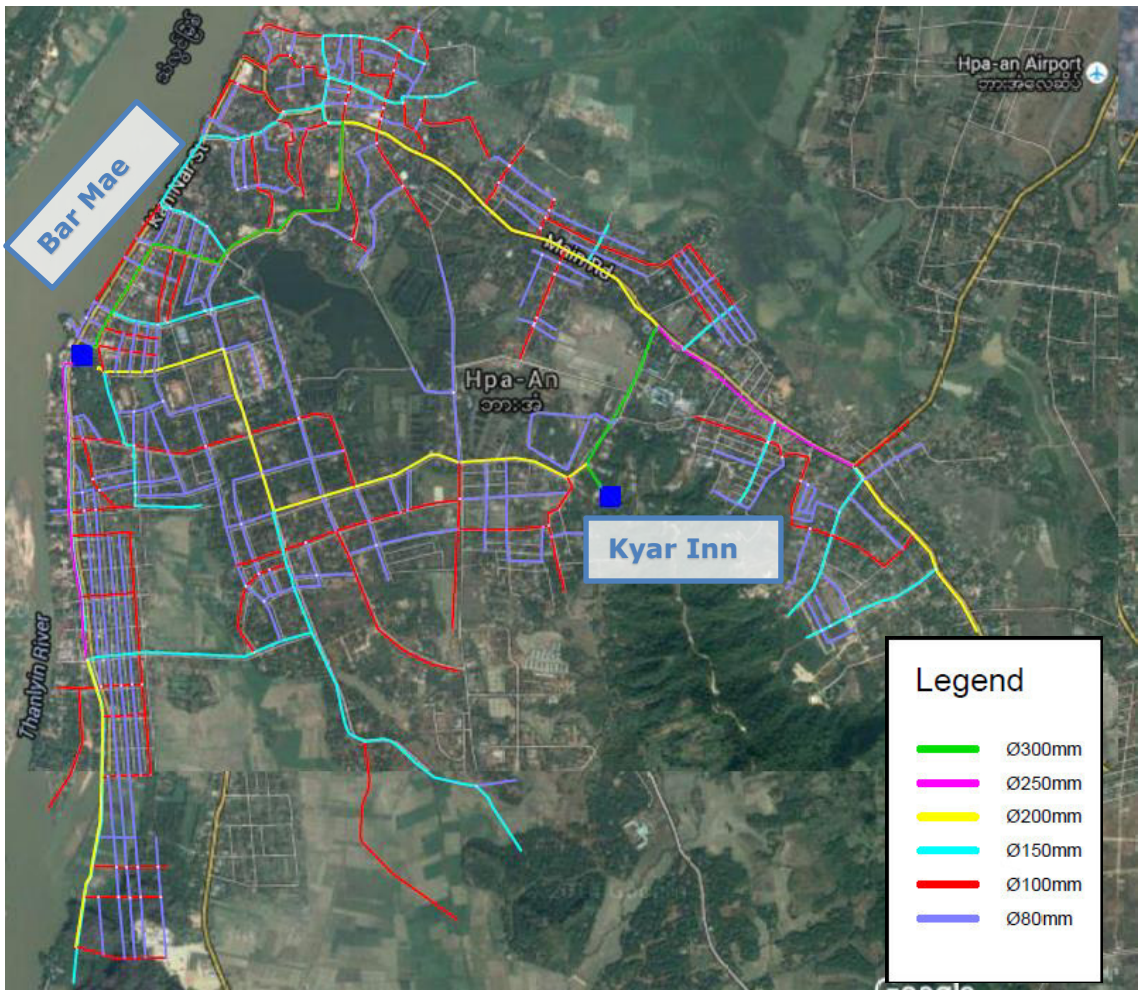
Table [11] LENGTH OF INTERNAL DISTRIBUTION LINES FOR HPA-AN

Diameter (mm)	≤ 80mm	100 mm	150 mm	TOTAL
Breakdown	45%	35%	20%	**100%**
Length (km)	35.6	27.7	15.8	**79.1**

At this stage, for durability and economic considerations, it is proposed to install ductile iron pipeline; alternatively HDPE could be considered for internal network.

Following map is a draft design of tentative future internal distribution network which shall be further detailed during the next steps of the Project:

Figure [16] TENTATIVE DRAWING OF HPA-AN FUTURE DISTRIBUTION NETWORK



The number of new connections is estimated to be nearly 12 800 by 2025 assuming that 14 000 households will be connected. New connections shall be implemented according to international standards with a defined procedure (material, maximal, length, registration…), and equipped with high quality water meters: certified class B or ideally class C.

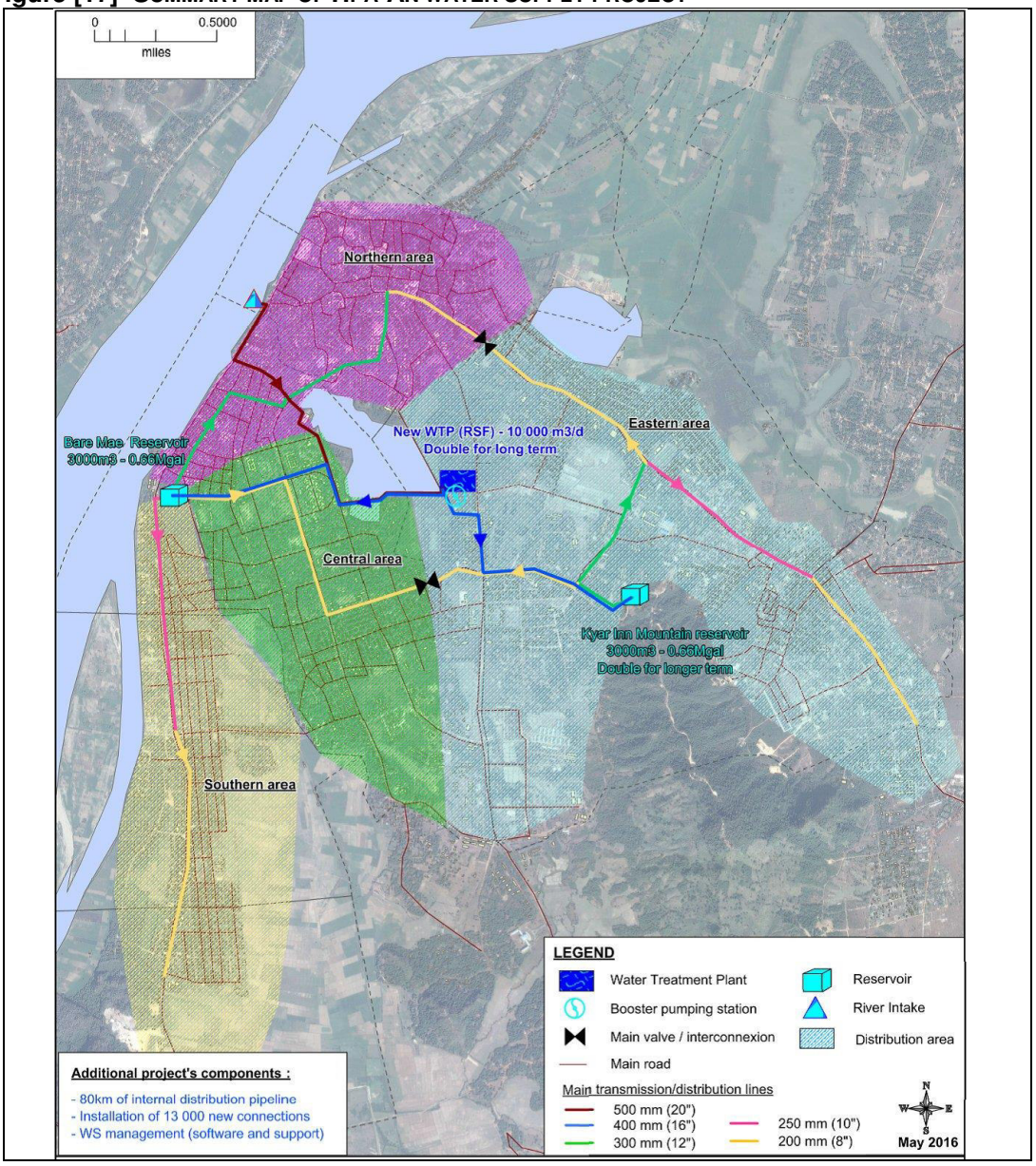
3.2.3.5 NRW Strategy

The project includes a full strategy to fight, control and reduce losses, from a macro scale to a household level, according to the objectives presented above. It is based on (i) quantification of losses, (ii) localisation of leakages and (iii) asset management plan.

3.2.3.6 Project Summary

The proposed water supply project and its components is summarized in the following summary map:

Figure [17] SUMMARY MAP OF HPA-AN WATER SUPPLY PROJECT



3.2.4 PROPOSED PROJECT FOR MYAWADDY

Water supply for Myawaddy covers the same sub-components as those described for Hpa-An, with required size and design adjustments. The proposed project includes a new water source from the Moei River aquifer, a treatment plant and a distribution system. This system will substitute existing public water supply using tubewells.

3.2.4.1 Water Intake

It is proposed an intake structure using infiltration gallery to pump water from the sub-surface flow of the Moei River and benefit from the bank filtration. A geological survey will be required to characterize the alluvial aquifer in order to design and size the intake structure. It consists in the installation of horizontal drains laid below the water table, surrounded by gravels to improve the flow. Number and size of drains depend on the soil characteristics and yields. Collected water from