

Initial Environmental Examination

April 2017

Myanmar: Third GMS Corridor Town Development Project “Mon State” (Part 3 of 4)

Prepared by SAFEGE International Department for the Asian Development Bank. This initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature. Your attention is directed to the “terms of use” section on ADB's website.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

4.8.3 TERRESTRIAL FAUNA

According to the world birds database (<http://avibase.bsc-eoc.org>) Mon state records 534 bird species from which 15 species are classified as globally threatened and 1 as introduced species. However, none of these registered species have been observed in urbanized areas which are mainly represented by Passeridae and Columbidae.

4.9 Protected Areas and Species

According to Forest Department (2009), 43 protected areas exist in Myanmar. Thirty-five sites were designated from 1918 to 2010. Eight additional sites proposed from 1997 to 2008 are still under examination. The 35 designated protected areas cover approximately 42,000 km² of land, representing 6.2% of the total country area. In case of establishment of eight additional protected areas, proposed from 2001 to 2008, the area would increase 7,400 km² (1.1%), and the total area would be 49,500 km², representing 7.3% of the total land area. Two protected areas were notified in the Mon State and one in Kayin State (Mitsui & Co., Ltd, 2015).

In Mon State, there are two wildlife sanctuary named Kelatha wildlife sanctuary and Kyaiktiyo wildlife sanctuary (Site ID 15), respectively at 102 and 122 km from the project area. Both sanctuaries are not concerned by the project. Locations of Protected Areas are presented in **Figure 4-19**

The total numbers of reserved forest, protected areas, wildlife sanctuary in Mon State and their areas are mentioned in **Table 4-9**. None of these protection zones are located close to any of the project components.

Table 4-9: Number and Areas of Protected Areas in Mon State

STATE	ITEM	RESERVED FOREST	PROTECTED AREA	WILDLIFE SANCTUARY	TOTAL
Mon	No. of sites	15	1	2	18
	Area (ha)	184 059	15 978	18 022	218 059

Source: Statistical Yearbook 2011, Central Statistical Office, Ministry of National Planning and Economic Development, 2012

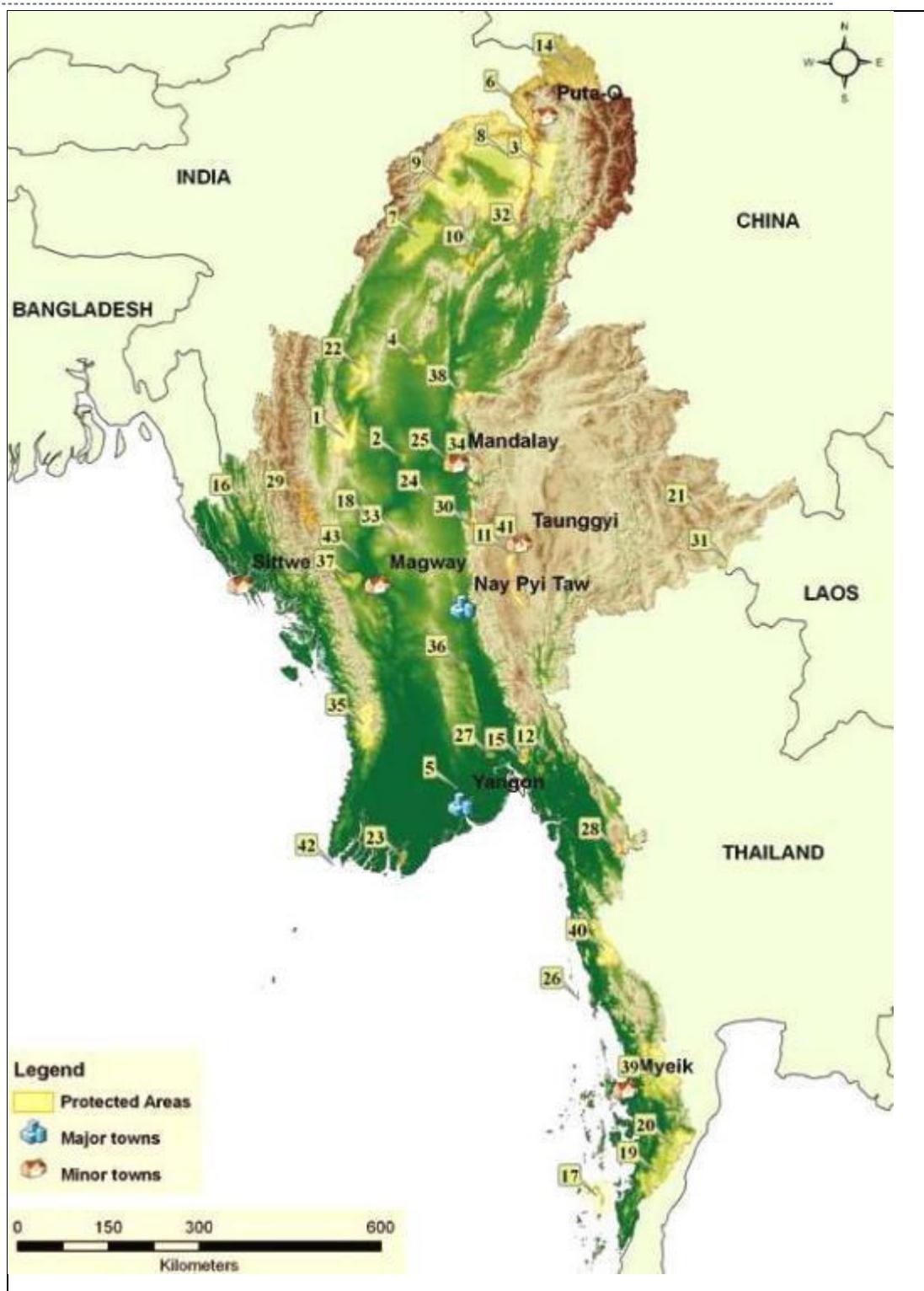
4.10 Social and Cultural Baseline

4.10.1 ADMINISTRATIVE ORGANIZATION

The division of administrative areas in Mon State follows the same dissecting arrangements as other states and regions. It starts with State which is divided down the line into Districts, Townships and Sub townships, Towns/Sub-towns, Wards/Village Tracts and Villages. The list below in **Table 4-10** shows the division of administrative areas in Mon State.

Figure 4-19: Locations of Myanmar Natural Protected Areas





The land area of the Mawlamyine township is 21 895 ha, with the widest area from east to west of seven miles and from north to south 17 miles. Mawlamyine township is bordered by Kyaikmayaw township in the east, Chaungsone township in the west, Mudon and Ye townships in the south and Hpa-An in the north. It is made up of 28 wards and 51 villages.

Table 4-10: Division of Administrative Areas in Mon State

DISTRICT	TOWNSHIP	TOWNS/SUB-TOWNS	NO. OF WARD	NO. OF VILLAGES	
Mawlamyine	Mawlamyine	Mawlamyine	28	51	
	Kyaikmayaw	Kyaikmayaw	2	171	
	Chaungzon	Chaungzon	3	79	
	Thanbyuzayat	Thanbyuzayat	9	95	
		Kyaikkhami	6		
	Mudon	Mudon	4	56	
	Ye	Ye	9	81	
		Lamaing	3	59	
		Khawzar	2	24	
Total Mawlamyine			66	616	
Total Mon State (Mawlamyine + Thaton)			86	1297	

Source: UNDP Myanmar Information Management Unit

Notes: All sub-townships were upgraded to township level by the presidential order in 2013. No indication is given by the source to the division of villages between Thanbyuzayat and Kyaikkhami townships, between Thandaunggyi and Thandaung townships and also between Kawkareik and Kyondoe townships.

Administrative Officers are placed in each level of structure starting from State level down to village level. All of them are employees of General Administrative Department (GAD) under the Ministry of Home Affairs. Administrative Officer at State level has the official position of Director/Deputy Director in the department. Administrative Officer at ward or village level is however elected by constituents of wards or villages but paid monthly allowances by GAD.

4.10.2 POPULATION

Population and Ethnic Groups

According to 2014 National Census of Myanmar Total population in Mawlamyine Township is 289,388 including an urban population of 253,734 as in **Table 4-11**.

Table 4-11: Population in Mawlamyine

STATE/TOWN	URBAN	TOTAL
MON STATE	572,189	2,054,393
Mawlamyine	253,734	289,388
Thaton	55,047	238,106

Source: Census 2014 Myanmar

Table 4-12 shows the ethnicity in Mawlamyine and in the wards where the project components are being proposed.

Table 4-12: Ethnicity in Mawlamyine Township (2015)

AREA	ETHNIC GROUP								TOTAL ETHNIC POP	
	KACHIN	KAYAH	KAYIN	CHIN	MON	RAKHINE	SHAN	PAO		
Urban	17	54	2581	26	28456	209	665	20	131515	163543
Rural	17	108	2618	27	45328	215	704	24	141700	190741

Total	34	162	5199	53	73784	424	1369	44	273215	354284
-------	----	-----	------	----	-------	-----	------	----	--------	--------

Source: Township Administrative Department, 2015

4.10.3 EDUCATION

In order to provide young people with access to higher education in the region, there are a number of higher education institutions including an institute of technology, Mawlamyine Art and Science University, and one educational college producing professionals and technicians. In regards to basic education, there are 15 basic education (pre-university) high schools (branch), one basic education high school, one basic education affiliated high school and 14 basic education middle schools, 13 post-primary schools, and 120 primary schools. In terms of quality, Mon State won the first prize for best matriculation results for the education year of 2008-2009 (Chingmai University).

4.10.4 PUBLIC HEALTH

Hospitals, dispensaries and health centres are being expanded to provide health care services in Mon State. There are 4 government hospitals, 6 private clinics, 3 Rural Health centres and 12 Sub Health centres in Mawlamyine with 96 doctors, 168 nurses and 32 midwives (2014).

4.10.5 WATER SUPPLY

In terms of existing water supply, Mawlamyine is served by three distinct resources as in **Table 4-13** namely:

- Water from the KhinPonChong reservoir created in 1904³ together with an old distribution system which is still supplying 24/7 water by gravity to the main storage reservoirs and thereafter distributing to the main city;
- A newer reservoir, ShweNatTaung reservoir which supplies by pumping to the main storage reservoirs (3 reservoirs of 500,000 gallons each);
- Two water intakes from the Attran River, which shall be reunited into one intake under a Thai company project.

Table 4-13: Mawlamyine Surface Water Supply Sources

NAME	DAILY SUPPLY RECORDED (M3/D)	DAILY SUPPLY EXPECTED (M3/D)	DAILY SUPPLY CAPABLE (M3/D)
ShweNatTaung Dam	10,050	10,050	21,045
KhinPonChong Dam	12,500	8,000	8,000
Attran-1 River Intake	6,144	6,144	8,400
Attran-2 River Intake	7,444	7,444	8,340
Total	36,138	31,638	47,785

³ The KhinPonChong dam can be considered part of the unique cultural heritage of Mawlamyine. The design of the rehabilitation measure for the dam should preserve and enhance the existing features.





Water is transferred through gravity from the KhinPonChong Dam to the three tanks reservoir. Water from ShweNatTaung Dam is transferred to Three Tanks Reservoirs by pumping and via RTC reservoir. The northern zone of Mawlamyine is currently partially served by the Attran River intakes (Wards 1 to 12). The southern zone and the major expansion area are currently partially served by the two reservoirs. This covers today urban wards 13 to 23. Wards 24 to 28 are currently not served by the current system as well as the rural villages.

In addition to the JICA financed project, another project is under consideration: The Thai Tap Water Project (TTWP), developed by a private Thai water supply company, which intends to supply the northern zone from an intake in the Attran River. This Project is totally independent from the present ADB project.

4.10.6 SANITATION

Wastewater treatment consists entirely of septic tanks and discharges to the natural or storm drains crossing the city and discharging directly to the estuarine front/esplanade area. The present Project doesn't cover sanitation.

4.10.7 SOLID WASTE MANAGEMENT

Mawlamyine Town Development Committee (MTDC) provides solid waste collection services to 23 of the 28 wards (which represent about 90% of the total population). MTDC relies on only 7 waste vehicles for 23 Wards and they have no possibility to include the other 5 wards to incorporate in the SWMS (Solid Waste Management System). Normally waste is collected twice/week.



Assuming a population of 258,809 in 2015 with a waste generation of 0.55/kg/capita/day results in about 142 ton/day. Initial observations estimate that around 50% of waste is collected and dumped at the designated dump site. Inadequate and uncontrolled waste disposal causes groundwater pollution, unpleasant odour and air pollution by unauthorised burning of the waste, drain clogging and spreading of mosquitoes. This has a negative impact on the city's health and environment. While the majority of the city is generally kept well clean, there are often accumulations of solid waste in drains which are washed down to the sea front and accumulate near to the promenade area. Most of the activities are operated by MTDC, but there is one ward (MyaingThaYar) which is actively undertaking a community based collection system.

At the moment the hazardous waste is not separately collected but mixed with household waste. Regarding the medical waste, none of the 5 hospitals and 6 clinics of Mawlamyine have any special provision as incinerator for the disposal

of medical waste. These are directly disposed on the municipality landfill, with major contamination risks for the waste pickers.

At present, part of recyclable waste (steel, paper, aluminium, plastic) is collected by the informal sector at landfill level. This aspect is detailed in the RAP prepared in parallel with the present IEE.

Solid waste is dumped at a site to the South-East of the main city, along the Kyaikmayaw road, upstream of the Attran river water supply intakes; even if leachate follows few km of natural drainage before its junction with the Attran, there is a potential risk of contamination of these water resources by the leachate from the dump site.

4.10.8 CULTURAL HERITAGE

Mawlamyine currently has a rich built history which many other urban centres in the region have lost in their rapid desire to move to a "modern" city. There is a short window of opportunity (perhaps 5 years) during which there is time to conserve much of this heritage and then use or convert this resource to attract tourists and create related sustainable employment directly as guides/historians and indirectly through extra generated income in hotels, restaurants and travel related businesses. Several buildings currently in government use have the potential to be converted into more efficient and more appropriate working spaces better suited to modern needs.

Mawlamyine has a number of major historical attractions such as KyaikThalan pagoda (erected in 875 A.D), U Zina pagoda (3rd century B.C according to legend) and the Mahamuni pagoda (1904).

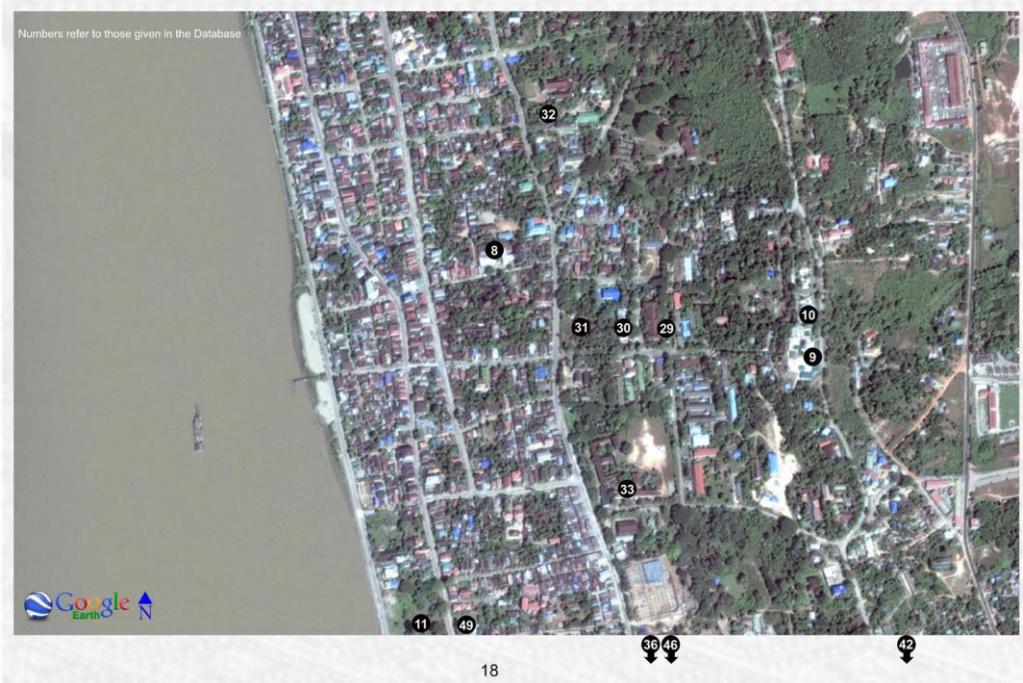
There are hundreds of potential heritage (100+ years old) buildings/structures spread over a vast area within Mawlamyine, with a wide range of current government, religious, commercial and private uses, and colonial secular and religious buildings, many of which are associated with Mawlamyine position as capital of British Burma from 1826 to 1852.

Figure 4-20: Heritage Buildings of Mawlamyine



The South

တောင်ဘက်ပိုင်း။



Map Ref	Chapter Ref:	Current Name	Old Name	Location	When Built	Notable History
1	2, 4, 5	Kyaik Than Lan Pagoda		Taung Yoe Tan		Built following a competition with the Siamese. Several repairs over the years, notably in 1538 by Warenu, King of Martaban and later by the Setkyaw Wungyi. Present pagoda erected by Siamese porgy). Thila Withoddi (with a hair of Buddha). Repaired in 1831 for Rs. 1000. Measures 152 feet high and 377 feet circumference at the base.
2	3, 4	Mahamuni Pagoda	Bahanan Pagoda	Taung Yoe Tan		The Buddha image inside is based on one in a pagoda of the same name in Mandalay.
3	3	Yadanar Boone Myint Monastery, Seindon Miwaya Kyauung		Taung Yoe Tan	1886	King Mindon's Queen Sein Done, sought refuge here. A large Buddha was kept here before being installed in the Mahamuni.
4	3, 4	Tomb of the fourth daughter		Mahamuni Pagoda Road		
5	3	Basic Education Middle School B.E.M.S (8)		Pet Tan Quarter		The fourth daughter of King Thibaw previously lived here
6	3, 5	Basic Education High School B.E.H.S (5)	St. Patrick's School (1847); Old Jail (1840; 1850)	Shwe Taung Quarter		The De La Salle Brothers opened St. Patrick's School. Part of the Institute of the Brothers of the Christian Schools, who are exclusively dedicated to education. They were invited to Myanmar by Bishop Bigandet. In 1893, they built the boy's hostel (now the Cooperative Department). In 1903, the school was divided into two; to the west is St. Patrick's Boys School and to the east St. Joseph's Convent for girls. Prince Sukkasem from Thailand attended St. Patrick's around 1905.
7	3, 5	University of Distance Education	St. Joseph's Convent Girl School	Shwe Taung Quarter		The compound includes a derelict building which used to be part of the old Prison. Entry to the school is not allowed.
8	3, 6	B.E.H.S (9)	Shin Maha Buddaghosa National School	Pan Pae Tan Quarter	1905 (the main building)	Founded by the Sasanadhara Society, the school produced notable writers and politicians who played a role in the Burmese independence movement. Still one of the most prestigious high schools in the city. Sein Tin (Theippaan Maung Va), writer, matriculated in 1919. In 1929, Mahatma Gandhi addressed a conference at the school. Note the two-storey teak building named U Thar Nyan Dhammayon.
9	3, 6	U Zina Pagoda	Kyakpatan (white hill)	Taung Yoe Tan		Named after former monk who dreamt of finding gems in this spot and did, then used the proceeds to build a temple. Repaired in 1830 at cost of Rs 600 by U Lugalyai and wife Daw Mi
10	3, 6	Pa Yan Pyan		Taung Yoe Tan	1904	Repaired to U Thar Nyan's dream. He dreamt of the building but could find no-one to construct the detailed interior designs in real life. On the left before arriving at U Zina.
11	3	Rookmanund Timber Mill				Note the several remaining brick chimneys along the waterfront. His original house was in the Military Camp area 204.
12	4	Kyakpanae Pagoda	Kyakpanae Quarter			
13	4	Yadanar San Kyauung Monastery		Taung Yoe Tan	1948	The temporary resting place of the statue of Buddha when it arrived by water
14	4	Magazine				Solid brick building used to store ammunitions from the earliest days of the Cantonment
15	4	Cantonment Pillars				
16	5	B.E.H.S (6)	Nilar Building	Corner of Tawae Ta Da Street and Upper Main Rd		First Burmese Girl's School. Previously known as Morton Lane Judson School
17	5	State Government Office		Baho Street	1928	The Municipal Clock Tower was erected in 1912 by the citizens to commemorate the reign of Edward VII.
18	5	Ebenezer Baptist Church		Baho Street	1829	
19	5	First Baptist Church		No. 60, Upper Main Road, Ma Yan Gon Quarter		Founded by American Adoniram Judson, who had a long relationship with the country. In 1827, he founded the First Baptist Church order. In 1830, he printed the Bible in Myanmar language. An inscription to this is in the B.E.M.S (5) compound.
20	5	St. Patrick's Church		Shwe Taung Quarter	1903	
21	5	Cooperative Department	St. Patrick's Boy Hostel	Shwe Taung Quarter	1896	
22	5	Prison			1908	

Map Ref.	Chapter Ref.	Current Name	Old Name	Location	When Built	Notable History
23	5	Maw Ya Wadi Garden	Victoria Gardens	Baho Street		
24	5	Port Authority		Baho Street		
25	5	Department of Education		Baho Street		
26	5	Forest Office		Baho Street		
27	5	Department of Construction		Baho Street		
28	5	Ellen Mitchell Memorial Hospital	American Hospital		1917	Mount Hope lies abandoned in the grounds
29	6	General Administration Office				
30	6	Court House				
31	6	St. Matthew's Church		Mayangone Quarter	1887	Consecrated in 1890. Tower is a memorial to members of Bombay Burmah Corporation members killed in 1WW. The church was originally in the Cantonment Area (built in 1843)
32	6	St. Mary's Church		Near B.E.H.S (6)	before 1876	In the grounds of the Holy Family Cathedral Catholic Mission which dates from 1958
33	6	B.E.H.S (1)		Upper Main Road, Pae Bae Tan Qt, Mawlamyine		The first Government School. Government High School (Company Kyauk)
34		B.E.H.S (4)	Baptist Karen Normal School		1854	
35		B.E.H.S (8)		Pet Tan Quarter		Before the Second World War, it was St. Joseph's Convent (for Girls). It was a Japanese Office during the war. It then became the Pway Sitt Chinese School.
36		B.E.M.S.(7)	SPG		1880	
37		Daing Won Kwin Market				
38		Kyaikpanai Mosque		Kyaikpanae Quarter	1896	
39		Lydhurst				Private house. See http://www.greatmirror.com/index.cfm?navid=265&picturesize=medium
40		Ma Gyi Daw Shwe Kyauung		Taung Yoe Tan	1240 (Myanmar Year)	The first Brick Monastery in Mawlamyine
41		Market (Ka Lar Zæ)				
42		Police Training School				
43		Raihang Mosque		Shwe Taung Quarter		Abandoned and gutted building on the top of the ridge. Built in 1820's or 30's. Burnt down in 1860's fire. Brick replacement. Damaged in the 2nd World War.
44		Sikh Temple		A Shae Tet Myay Street, Pet Tan Quarter		
45		B.E.M.S (1)	St Matthews Boy's School			
46		St. Augustine's Church			1883	
47		Surtee Sunni Jamee Masjid		No. 139/14, Lower Main Road, Pet Tan Quarter	1848	
48		Telecommunication Department				This was the site of the Bank of Bengal
49		Thanlwin Hotel	House of Rookmanur			Was also a Regional Party Office
50		Tower House	Andaman Club			
51		U Khanti Pagoda		Taung Yoe Tan		Built to commemorate the architect, U Khanti. Can buy coins to throw into revolving bowls and make wishes.
		Kay Mar Thi Won Monastery	Japanese Jail	Tha-yet-kong Quarter, Thiri Myayn Quarter		South of Mawlamyine

There are very few groupings of heritage buildings including:

- the North end of the ridge which has a number of pagodas and associated buildings with interesting histories;
- the area south and east of the Myawaddy Park which has several functioning government buildings; and
- the area around St. Patrick's Church and BEHS 5 which has a varied history.

And there are a number of mature trees have been retained in conjunction with several of the heritage attractions. They would also need to be protected in future as an integral part of each heritage building and its curtilage/habitat.

After detailed consultation between the Project, the Municipality of Mawlamyine and the Mon State Government, decision to include as a project component the rehabilitation of the Administration Complex U building, a reasonably well preserved building from the British colonial period. An architecture company from Yangon, with building restoration experience in Myanmar, was appointed to prepare, within the PPTA framework, the rehabilitation study.

5 IMPACT ANALYSIS

5.1 Methodology

The impacts were identified by confronting the environmental and social baseline situation of the area with the activities related to each component and stage of the project. For every interrelation between Project activities and each pertinent environmental component, all probable impacts have been identified.

This identification was mainly based on:

- The technical information related to project components design and operation as presented in Chapter 3 of this report;
- Field visits conducted in August-September and November 2014 by the Consultant in the Project area;
- The Consultant experience of environmental impacts of a variety of projects including urban development, water supply, sanitation and waste management;
- The checklists of potential impacts from various types of projects drawn up by international financial organizations (WB, ADB, AFD).

The result of this analysis is presented in the following sections covering 1) impacts connected with the location of the projected facilities, 2) impacts connected with construction activities and 3) impacts connected with the actual operation of the facilities.

The potential impacts for each of these sections are presented in a summary table, followed by descriptions and analyses of the most probable significant impacts. These tables present, successively, the cause of the impact, the potential impact along with its risk level, the corrective measure along with the ease/difficulty of implementing it and the residual risk level after implementing the measure.

Each summary table shows, for each identified impact, an assessment of the overall risk level, taking three criteria into a consideration: the probability of occurrence of the impact as part of the project, the expected gravity of such an impact given no special corrective measures, and the difficulty of implementing the proposed corrective measures.

- The probability of occurrence reflects how often the impacts are observed during construction and operation of similar projects: some impacts are inevitable (noise, dust, suspended sediment in surface water) whereas others occur only exceptionally (accident, explosion).
- The gravity of an impact incorporates various considerations of intensity of effects on the natural or human environment, its extent and its duration. All necessary efforts must be made to implement corrective and monitoring measures on impacts that are judged to be potentially serious.
- The overall risk relating to an impact, rated from 1 (low) to 3 (high) takes into account the abovementioned criteria.

Table 5-1: Impact Assessment Criteria

CRITERION	LEVEL 1	LEVEL 2	LEVEL 3
Difficulty for implementing corrective measures	Easy, inexpensive and generally effective	Demands special attention (monitoring or training, for example)	Difficult due to complexity or cost
Probability of occurrence of the impact	Low: can be seen in cases of negligence or accident	Medium: generally seen a few times during construction or during the operation of the concerned facility	High: consistently seen if effective corrective measures are not put in place
Gravity of the impact	Generally limited impact in terms of intensity, duration or extent	Significant environmental impact but not endangering human or animal populations	Major environmental impacts with risks to people or special-status animals
Overall Risk	Low: subject of routine monitoring but impacts are minor and easily manageable	Significant: merits special attention	Major: merits close monitoring and the implementation of effective measures

5.2 Anticipated Benefits from the Project

The components of the Project are anticipated to significantly improve the environmental conditions and quality of life of the population in Mawlamyine through the following results:

- Better quality of life and public health by the improvement of the water supply services and security through (i) increasing the water supply service in terms of satisfaction of the demand, providing 24/7 supply and good water pressure, increasing storage capacity of the system by the construction of a new storage next to KhinPonChong dam, (ii) reduction of non-revenue water and extension of serviced area, (iii) construction of a water treatment plant and (iv) improving and extending the distribution network;
- Better quality of life and public health by the improvement of solid waste management through better collection and safe disposal of waste: increased number of collection vehicles and collection points, a new transfer station and upgrading and extension of sanitary landfill, construction of an incinerator for medical waste, rehabilitation of former landfill site;
- Better quality of life and public health by improving indirectly rainfall drainage: improvement of solid waste collection shall reduce the volume of waste presently dumped in the drains and clogging the system. This shall also reduce the temporary and localised flooding which occurs during heavy rainfall.
- Contribution towards Green City Principles through the implementation of a composting plant for solid waste. When compared to the "No Project" option, the Project solid waste component shall reduce the GHG emissions in Mawlamyine by as much as 42,600 tons of CO₂-eq per year in 2020 and 132,000 tons of CO₂-eq per year in 2040. The Project shall reduce the cumulated GHG emissions by as much as 2,3 million tons of CO₂-eq over the period 2016-2040;



- In addition to the improvement of Mawlamyine cleanliness, the Project, through its cultural heritage preservation component, shall favour the general beautification of the city in the long term and consequently boost its tourism attractiveness.
- Secondary benefits related to increased attractiveness of Mawlamyine regarding investment, economic development, tourism, employment, income and increased value of land and buildings.

5.3 Impacts related to Project Location

5.3.1 IMPACTS ON LAND ACQUISITION AND RESETTLEMENT

Water Supply Components

Water Treatment Plant

Water treatment plant to be constructed just next to the KhinPonChong dam will require about 3,000 m² or 0.75 acres. Land area is currently unused land owned by the State Development Committee. As there is no asset on the land, no land acquisition nor compensation or resettlement is required. The site is already accessible from KhinPonChong dam and will not require access road. As the area is surrounded by a military compound, agreements for access from the main road will be needed. However no difficulty is expected here as the access was easily provided to PPTA consultants during their mission. Nearest residential receptor is a Monastery but which buildings are more than 500 m from the proposed facility.

New Water Storage at KhinPonChong

The new 4,000 m³ storage to be constructed shall require about 1,400 m² (0.35 acres). The land is located next to the proposed water treatment plant, on a land owned by MTDC.

Rehabilitation of the 3 existing storages

The 3 reservoirs of 500,000 gallons (2,200 m³) each, located Kan Thone Kan inside Mawlamyine urban area, shall be rehabilitated including limited rehabilitation of piping system, and rehabilitation of the building sheltering control valves. Construction of a concrete roof cover of the 3 reservoir initially proposed was in fact completed in 2016 under a Jica Project (See Due Diligence report attached). As rehabilitation doesn't include any extension, no additional land is required, no tree cutting necessary and no impact on any external built-up property located near the reservoirs.

Rehabilitation and extension of main and network supply system

The existing main pipe system to be replaced is located along roads, as well as the distribution system considered under this project. As the system relies on gravity distribution, no pumping station shall be required. This component will not require any land acquisition nor resettlement. In densely urbanised area, the component shall mainly result in temporary nuisances during construction, including sometimes difficult access to certain places (shops, government buildings, hospitals etc.). These impacts shall be mitigated during the construction phase on a case by case basis in order to avoid or minimise nuisances.





WS: PROPOSED LAND FOR WATER TREATMENT PLANT



WS: SAME, SHOWING ELECTRIC LINE AVAILABLE ON SITE

SOLID WASTE COMPONENTS

Sanitary Landfill and Composting Plant

The site is located near the existing landfill site. The nearest surrounding houses are located at least 300 meters far from the proposed new site. The future land would measure 19.4 ha (48 acres) and mostly belongs to the Mon State Government except 1.5 ha (3.7 acres) to be purchased from a private owner. The land is presently unused, vegetation is low scrub with scattered trees of small size. No significant forest clearing is anticipated.

The 4.8 ha (12 acres) old site would be closed. The waste pickers currently living in the area will receive compensation according to the preconisation of the Resettlement Plan implemented under PPTA 8758.

A temporary stream is located in the middle of the proposed future land. This stream is dry except during the rainy season according to the villagers. A hydraulic analysis is included in the landfill detailed design cost estimate. The path of the stream must be diverted and well designed in order to avoid leachates collection but also flooding. The stream is displayed in blue on the picture below.



MSW: VIEW OF NEW LANDFILL



AREA ANTICIPATED FOR NEW LANDFILL

CULTURAL HERITAGE COMPONENT

The building under consideration for rehabilitation is the administrative complex (GAD) building in PaBaeTan Ward. No land acquisition nor compensation is



required as the works shall not encroach outside the premises. As already mentioned, the project assessment has been carried out by a competent architecture company from Yangon, in compliance with requirements SPS SR1, Section 11.

5.3.2 IMPACTS FROM CLIMATE CHANGE AND NATURAL HAZARDS

Climate Change (CC) or natural hazards are not anticipated to represent a risk in relation to project components location:

- Project components are not located in floodable areas or areas anticipated as floodable in the future.
- The general topography is rather smooth, not prone to landslide.
- Seismic risk in Mawlamyine is considered as low (refer to 0).
- No fault or fractured geological structure is observed at the landfill site, as the area is developed on deep sedimentary deposit.

None of the Mawlamyine Third GMS Corridor Project component is anticipated to be particularly exposed to CC or natural hazards because of its proposed location.

5.3.3 IMPACTS ON CULTURAL HERITAGE

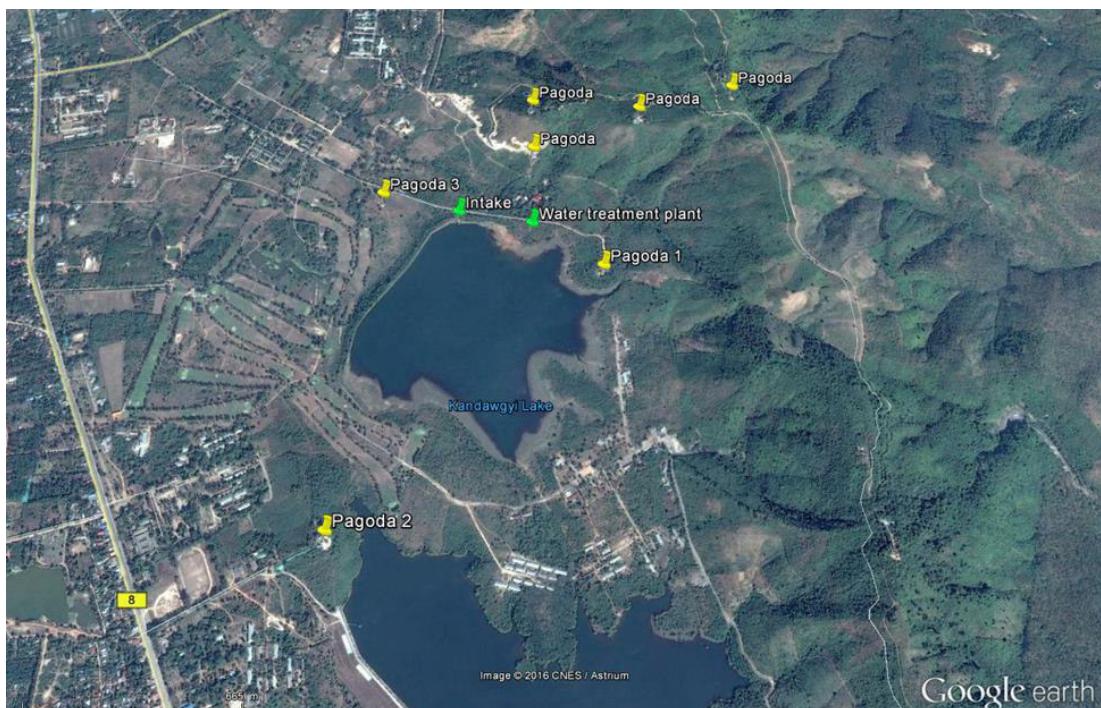
The Project has a dedicated component for the conservation and rehabilitation of Mawlamyine historical buildings, consequently with strong positive impacts on the city cultural heritage. Action program has been prepared by a recognized architecture company currently working on cultural heritage sites restoration in Myanmar.

The historical (heritage) buildings identified during the assignment showed evidence of no heritage features in the vicinity of the Kin Pon Chong reservoir (except for the reservoir features notably the intake itself⁴). In the vicinity of the two reservoirs there are a number of Pagodas as illustrated below. None are affected by the project during construction

⁴ It will be necessary to ensure protection of these features as part of the rehabilitation of the reservoir to be financed under the project



Location of Pagodas around reservoir sites



5.3.4 IMPACTS ON NATURAL RESOURCES

Being mainly developed inside or nearby urbanized areas, none of the components of the Project has significant impacts on natural resources. Few old trees (3 to 5) may be cut in the urban area to accommodate the transfer station for the solid waste, but detailed design will take the constraint into consideration to avoid or minimize such impact.

The vegetation of the proposed landfill and the water treatment plant consists mainly of scrub land with few scattered trees of small size.

No wetland or protected area is affected by the project location.

5.3.5 SUMMARY OF IMPACTS AND MITIGATION MEASURES

Table 5-2 summarizes the impacts relating to the location of the 3rd GMS Project Components in Mawlamyine.

IEE REPORT-MON STATE-JUNE 2016

TA 8758 – Preparing Third GMS Corridor Towns Development

Table 5-2: Summary of Impacts related to Project Components Location in Mawlamyine

COMPONENT OR ACTIVITY	POTENTIAL RISKS	POTENTIAL IMPACT	IMPACT ASSESSMENT			CORRECTIVE OR SUPPORT MEASURE	DESCRIPTION OF MEASURE	EASENESS OF IMPLEMENTATION	OVERALL RISK AFTER CORRECTION
		DESCRIPTION OF IMPACT	PROBABILITY	GRAVITY	OVERALL RISK				
Improved Water Supply System									
Upgrading KPC reservoir water intake	None related to the location	No land acquisition required. Temporary land needed is part of the dam area. No resettlement required.	-	-	-	No particular measure required		-	-
New storage next to KhinPonChong reservoir	Permanent and temporary land occupation	Next to WTP on MTDC land. No land acquisition is required, no built-up property is affected. Area large enough to satisfy needs for temporary land use during construction.	3	1	2	No particular measure required Monitor during construction temporary land occupation in compliance with previsions.		1	1
Construction of a Water Treatment Plant	Permanent and temporary land occupation	Only 3 000 m ² required of land belonging to MTDC; no land acquisition required and no built-up or crop production to compensate. Access road existing, just rehabilitation required. Land available large enough to satisfy temporary needs during construction. No adjacent residents.	1	1	1	No specific measure except monitoring during construction to ensure no encroachment happens outside dedicated area.		-	-
	Vegetation clearing	No forest or large trees concerned. Only open scrub over unused land	-	-	-	No specific measure required.		-	-
Rehabilitation of existing reservoirs	3 Permanent and temporary land occupation	Rehabilitation concerns only civil works improvement and roofing without extension. No land required, no impacts on vegetation and built-up properties	-	-	-	No specific measure required.		-	-
New water distribution pipe system	Permanent and temporary land occupation	Short term land occupation required during works which may locally impact road traffic and access to house or business in urban area. Possible need for tree cutting	3	2	1	Minimize as much as feasible tree cutting; Compensate by 2 trees planted for 1 tree cut;		1	1
Improved Solid Waste Management									
Creation of Sanitary Landfill	Permanent occupation of land	Land mostly belongs to Mon State Government. 1.5 hectares to be acquired from private owner. Possibility for few trees to be cut. Access to site already existing (existing landfill)	3	2	2	No particular measure required. Ensure the 250 meters buffer zone around any cell with no housing is respected at detailed design stage.		1	1

IEE REPORT-MON STATE-JUNE 2016

TA 8758 – Preparing Third GMS Corridor Towns Development

COMPONENT OR ACTIVITY	POTENTIAL RISKS	POTENTIAL IMPACT	IMPACT ASSESSMENT		CORRECTIVE OR SUPPORT MEASURE			EASINESS OF IMPLEMENTATION	OVERALL RISK AFTER CORRECTION
		DESCRIPTION OF IMPACT	PROBABILITY	GRAVITY	OVERALL RISK	DESCRIPTION OF MEASURE			
		No built up property on the land.							
	Stream diversion	Deviation of a temporary drain usually dry except during rainy season.				Undertake diversion and reduce future flood risk. The future stream must not catch leachates from the new dump site.			
Closing the old dump site	Permanent land occupation	Disturbances regarding wastepickers available work.				Measures already included in resettlement plan.			
Creation of a Composting Plant	Permanent land occupation	Plant located on the premises of the landfill site. No further land required and more than 250 m from closest residents.	-	-	-	No particular measure required	-	-	
Construction of Collection Points		56 collection points (2 per each of the 28 wards) consisting of a concrete slab with 3 containers of 240 l in each point. Installed on public space, land acquisition or building demolition not required. Most located on existing collection points.	-	-	-	New collection points to avoid proximity with sensitive locations (monasteries and pagodas, hospitals, schools etc.)	1	1	
Improved Waste Collection equipment	Need for garage & parking area	No land required as parking & maintenance area installed in Municipality compound	-	-	-		-	-	
Improved Cultural Heritage									
Rehabilitation of a Government building	Permanent and temporary land occupation	No additional land requirement; Risk of nuisances and safety issues during rehabilitation works	2	2	1	Tendering for companies to include detailed EHS specifications for the construction period; Training of MTDC for supervision of EHS compliance during works	2	1	
Implementation of procedures for financial support to owners of CH buildings		Main risk is to have rehabilitation works not performed in compliance with best practices with impacts on nearby buildings, street trees cutting etc.	3	2	2	Preparation of strict technical and EHS specifications for the works as an obligation to benefit financial support. MTDC to ensure compliance is achieved during rehabilitation	2	1	

5.4 Impacts and Mitigation during Construction Stage

5.4.1 DISRUPTION TO COMMUNITY UTILITIES

Construction works in urban areas, particularly those involving ground excavation works, may involve a temporary disruption of utilities for individuals or groups of residents. The following components of the project may involve such impacts:

- Water supply network rehabilitation poses only a short term concern to residents affected by construction activities. Interruptions to power and communication, disruption of water supply, discoloration of water from re-located pipes can be anticipated but should not exceed periods of few consecutive days; Contamination of water during replacement of pipes along the network may happen, but with limited risks for public health as water distributed presently is not potable and not used directly by the population as drinking water.
- Water supply network extensions shall not create any significant disruption in existing water supply as population in concerned areas relies either on tube wells, shallow wells or small independent distribution systems.
- Some disruption related to electricity supply, to accesses to households and shops or to road traffic may be temporarily and locally observed when laying down the main pipes along the streets.

To minimize impacts, the contractor shall implement the following measures:

- Water supply pipelines, power supply, communication lines and other utilities shall be re-provisioned before construction works commence;
- Provisions shall be made to preserve the operation of current facilities in sufficient quantity and in agreement with the local community;
- Re-provisioning shall be undertaken in coordination with MTDA and other concerned utility companies;
- Affected households and establishments shall be notified at least 3 days in advance of such disruption if its duration is less than 24 hrs. Notification shall be given at least 1 week in advance if disruption is anticipated to last more than 24 hrs.

5.4.2 IMPACTS ON AIR QUALITY

MAIN SOURCES OF IMPACTS

The main sources of air pollution are machines burning fuel for digging, transportation and loading. Dust and waste gas from these machines affect air quality in the surroundings of construction work places. Areas most affected are located in a range of around 50 m all around project sites, but also along the main access roads to sites which will be supporting heavy traffic of trucks. Carbon dioxide and other harmful pollutants may also be released through the burning of waste on construction sites, including plastics.

The production of dust is generally the most widely perceived nuisance generated by earthworks and transport on non-surfaced roads during dry season. Works



carried out for water supply network rehabilitation may significantly generate dust if no preventive measure is applied during excavations.

MITIGATION MEASURES

Best management practices will be adopted during construction to minimize dust and combustion exhaust emissions. Mitigation measures to be implemented by the Contractors to minimize impacts on air quality shall comply with IFC guidelines on construction, which shall be at a later stage detailed in the bidding specifications. Main mitigation measures include:

- Reduce pollutant emission at source: Wherever possible, use electrically-powered equipment rather than gas or diesel-powered equipment; Use only vehicles and equipment in good condition for works in densely urbanised areas; Construction equipment and vehicles shall be well-maintained and meet with applicable national emission standards (MONREC, 2015); Undertake immediate repairs of any malfunctioning construction vehicles and equipment, particularly regarding smoke emission and noise. Maintenance and control of equipment shall be done by the Contractor under the supervision of the PMO..
- Burning of wastes generated at the construction sites, work camps and other project-related activities shall be strictly prohibited.
- Position any stationary emission sources (e.g., portable diesel generator, compressor, etc.) as far as is practical from sensitive receptors and residents.
- Control the risk of dust release: Keep excavated soil moist and cover vehicles and stockpiles with tarpaulin sheets or other suitable materials to minimize dust emission and prevent spillage of materials (e.g. soil, cement, stone, sand, aggregates, etc.). In dense residential area, spoils shall be loaded and transported immediately; provide wheel cleaning for any truck/car leaving muddy construction site (as the future new landfill or the water treatment plant) and accessing to public road; clean daily road surfaces of debris/spills from construction equipment and vehicles in the vicinity of activities.
- Ensure availability of water spraying facility on site if the works area is not surfaced, or dry and dusty, near sensitive receptors (i.e. residential areas, roadside tea and food stalls, monasteries, schools, hospitals and other sensitive receptors). Spray water on the exposed surfaces to reduce dust emission.
- Impose compliance with speed limits of construction vehicles (generally 30 km/h) to minimize dust emission as well as the risk of traffic accident.
- Provide prior notification to the community on schedule of construction activities which may generate some dust and implement 24 hour community grievance hotline.

5.4.3 IMPACTS FROM NOISE AND VIBRATION

SOURCES OF IMPACTS

Works for the rehabilitation of the water supply network could be the most impacting activity in terms of noise nuisances due to the operation of equipment like backhoes or jackhammers in the immediate vicinity with residences. Along the hauling roads for material and equipment, the average noise level will probably rise because of increased truck traffic.

Table 5-3 provides some typical noise levels measured at various distances from the emission point related to various construction machineries. These values are indicative and already used since several years. More efficient system of noise abatement are available on recent equipment.



Table 5-3: Noise Level of Various Construction Equipment in dBA

EQUIPMENT TYPE	15 M	30 M	50 M	100 M	200 M
Excavator / Backhoe	78	72	67	61	53
Bulldozer	78	72	67	61	53
Jackhammer	89 ⁽¹⁾	83	78	72	66
Air compressor	75	69	64	58	52
Vibrator	76	70	65	59	53
Mixer	75	69	64	58	52
Truck	76	70	65	59	53

⁽¹⁾: According to IFC-EHS Guidelines, PPE (ear plugs) must be provided to staff working in noisy environment starting from 80dBA.

At night, construction noise would impose a severe nuisance on the residents in the vicinity, especially those located at less than 50 m from activities. Night working and especially the use of the noisiest equipment during the night should then be strictly prohibited.

The present draft of the National Environmental Quality (Emission) Standards of Myanmar imposes restrictions regarding noise levels which should not exceed the values presented in **Table 5-4**, or result in a maximum increase in background levels of 3 dBA at the nearest receptor location off-site.

Table 5-4: Draft National Standards for Noise Levels

RECEPTOR	ONE HOUR LAEQ (dBA)	
	DAY TIME 07:00 – 22:00 (10:00 – 22:00 FOR PUBLIC HOLIDAYS)	NIGHT TIME 22:00 – 07:00 (22:00 – 10:00 FOR PUBLIC HOLIDAYS)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Source: MOECAF, 2014 and IFC EHS, 2007

Mitigation Measures

- Before site works commence, a Noise Control Plan shall be prepared by the Contractor and shall be non-objected by the PMO. The plan shall provide details of mitigation measures, specific location and schedule where such measures shall be implemented to minimize impacts to sensitive receptors (residential areas, schools, hospitals, etc.) due to construction works, sourcing and transport of construction materials, and other project-related activities.
- Restriction of noisy construction activities as well as the transport of materials to day time from 7:00 AM (10:00 AM on public holidays) to 10:00 PM, and enforce in residential areas the suspension of the works during night time.
- Reduction of noise level for surrounding population through a set of measures: Selecting equipment with lower sound power levels, installing silencers for fans, installing suitable mufflers on engine exhausts and compressor components, installing acoustic enclosures for equipment casing radiating noise, installing acoustic barriers without gaps and with a continuous minimum surface density



of 10 kg/m² in order to minimize the transmission of sound through the barrier position any stationary equipment that produce high noise levels (e.g., portable diesel generators, compressors, etc.) as far as is practical from sensitive receptors; whenever possible, completely enclose noisy equipment which can reduce noise level by 15-25 dB(A) and restrict duration of use of noisy equipment (e.g. 15 min for every consecutive 30 min period); erect temporary walls around the construction sites, as necessary, especially near sensitive areas such as schools, hospitals, administration buildings, monasteries, etc. All construction equipment and vehicles shall be well maintained, regularly inspected for noise emissions, and shall be fitted with appropriate noise suppression equipment consistent with applicable national regulations;

- Training of truck drivers: minimization of the use of horn, compliance with speed limitation particularly in residential zones.
- Provide prior notification to the community on schedule of noisy construction activities and implement 24 hour community complaint hotline.

5.4.4 OFF SITE PUBLIC SAFETY AND NUISANCES

Source of Impacts

All activities involving work along public roads (as construction of solid waste collection and transfer stations, water supply network rehabilitation or extension) will definitely reduce the accessibility to certain streets, reduce the number of usable lanes and create traffic congestion. The presence of population including children next to construction activities where heavy machinery is operating and with the presence of excavations and construction equipment will create additional risks for public safety.

Also, the working area may temporary alienate access to work sites, schools and community facilities. In addition, retail merchants may suffer economic losses if access is denied to their establishments. The project will be required to take all the necessary measures in order to minimize the detrimental side effects of construction activities particularly regarding traffic and public safety.

Mitigation Measures

The following measures shall be implemented by the contractor to address impacts to traffic flow and access to properties:

- Before site works commence, a Traffic Management Plan for the construction phase shall be prepared by the concerned contractors and shall be approved by the PIC. The plan shall be designed to ensure that traffic congestion due to construction activities and movement of construction vehicles, haulage trucks, and equipment is minimized. The plan shall be prepared in consultation with local traffic police. The plan shall identify traffic diversion and management, define routes for construction traffic from materials storage/parking areas to construction site and from construction site to waste disposal locations, traffic schedules, traffic arrangements showing all detours/lane diversions, modifications to signals at intersections, necessary barricades, warning/advisory signs, road signs, lighting, and other provisions to ensure that adequate and safe access is provided to cars, motorists and pedestrians in the affected areas.
- Provide signs advising road users that construction is in progress and that the road narrows to one lane using cones.



- Employ flag persons to control traffic at sites for safety reasons when construction equipment is entering or leaving the work area.
- Lanes through the work site created by rope or flagging, shall be developed to minimize risks of injuries.
- Post traffic advisory signs (to minimize traffic build-up) in coordination with local authorities
- Provide road signs indicating the lane is closed 200 m before the worksite and signs to indicate the proposed detour road.
- Provide sufficient lighting at night within and in the vicinity of construction sites.
- Regularly monitor traffic conditions along access roads to ensure that project vehicles are not causing congestion.
- As much as possible, schedule delivery of construction materials and equipment as well as transport of spoils during non-peak hours.
- Implement suitable safety measures to minimize risk of adverse interactions between construction works and traffic flows through provision of temporary signals or flag controls, adequate lighting, fencing, signage and road diversions.
- Comply with traffic regulations and avoid, where possible, roads with the highest traffic volumes, high density of sensitive receivers or capacity constraints are not used as access to and from the construction areas and spoils disposal sites.
- Provide induction training on road safety to drivers and ensure they comply with regulations regarding speed and the ban of alcohol when on duty.
- Install temporary accesses to properties affected by disruption to their permanent accesses.
- Reinstate good quality permanent accesses following completion of construction.

5.4.5 IMPACTS FROM WASTE PRODUCTION

Source of Impacts

Quantities of solid waste will be generated by construction activities or by worker camps and canteens. A plan for managing all these types of waste needs to be put in place. There are three categories of waste to consider: domestic waste, inert construction waste and hazardous waste.

The quantity of domestic waste, mainly produced by temporary or permanent camps set up for the needs of the project, can be estimated at 0.5 to 0.7 kg/person/day. This waste mainly includes waste from canteens, packaging, plastic bottles, glass bottles, paper and cardboard. As the project is located in an urban area which may supply most of the manpower required, it is not anticipated large worker camps, but small camps on the sites to ensure a presence 24h and the protection of the equipment. Production of waste should be rather limited nevertheless it is worth being properly managed.

Inert construction waste is generated on the construction sites in variable quantities. It consists mainly of wood, packing boxes, scrap, plastics and concrete debris (the later coming from the few demolition required). This waste is generally disposed of, and landfilled in appropriated sites or in permanent inert materials sites. They represent no direct danger to health. Scrap metal is generally collected



for recycling. Wood and cardboard waste if burnt on site will produce fumes and nuisance for the neighbourhood.

Hazardous waste such as vehicle batteries, oil filters, various containers that had held hazardous products (mainly paints, solvents, glue) and other alkaline/lithium ion batteries is generated by construction activities, but in specific places and in limited quantities. This waste is harmful to the environment and public health and must receive appropriate treatment so as to ensure it is eliminated safely. The main risk comes from used engine and hydraulic oil resulting from the maintenance on site of heavy equipment (backhoe, bulldozer, levellers, etc.) and which may be produced in significant quantities. If released on the ground, these hydrocarbons will involve surface and underground water pollution. The present project does not anticipate the maintenance of trucks on site, as the project is developed in an urban area where garage facilities are available for trucks. Hazardous waste also includes sludge from temporary toilets to be installed on construction sites within urbanized areas.

Mitigation Measures

EHS specifications for bidding documents will follow and detail EHS guidelines from IFC (2007). Main measures include the following:

Prior to the start of the works, the contractor shall be requested to prepare a Waste Management Plan addressing the management issues related to all types of waste and providing anticipated production and schedule, collection system proposed, disposal methods and location. The Plan shall reflect the following obligations:

For Non-hazardous Waste

- Provide garbage bins and facilities within the project sites for temporary storage of construction waste and domestic solid waste and ensure that wastes are regularly removed by the concerned department of Mawlamyine Township Development Committee and transferred to the existing landfill until new landfill is operational.
- Promote recycling on site and store material in appropriate storage areas before removal by recycling companies.
- Implement an employee awareness program in waste management and site cleanliness.

For Hazardous Waste

- Any waste engine oil and hydraulic lubricants from heavy machinery and the floating oily residue from oil separators will be collected and stored in tightly sealed containers to avoid contamination of soil and water resources. Transport and off-site storage of such wastes for recycling shall be presented in the Plan.
- Any container of such waste will be stored in a dedicated area with waterproof floor surrounded by a bund the height of which will ensure retention of a volume equal to at least 110% of that of the largest container stored in the area.
- Batteries, vehicle batteries, oil filters from the site will be sorted and deposited in separate containers. The contractor will identify a circuit for elimination/recycling of these products and will submit his choice to the PMO for non-objection.

- Any medical waste (in probably very small quantities) from the First Aid station on site shall be safely stored in a container before being delivered to the landfill area where the content will be burnt as none of the hospital or clinics is equipped with an incineration system.
- Metal or plastic containers that have contained hazardous or toxic chemical substances (mainly hydrocarbons, paints and glue) shall be collected with other hazardous waste for treatment and safe storage prior to recycling in a metal smelter facility).

As no facility does exist in Mawlamyine or even in Myanmar for the treatment and safe disposal of hazardous waste, it is proposed to implement, within the premises of the landfill area a temporary disposal area for hazardous waste, where the contractors will deliver all hazardous waste produced on the construction sites. This disposal area shall be implemented in priority at the start of the landfill construction works in order to service all contractors involved in the project.

5.4.6 HAZARDOUS MATERIAL MANAGEMENT & ACCIDENTAL SPILL

According to the type of construction activities anticipated for the present project components, it is not anticipated any significant storage of fuel on sites, as works are mainly implemented in urbanized areas with gasoline stations available. However, small quantities will probably be stored on site in jerry cans or 200 l drums to refill small equipment (compressor, generator) or heavy machinery (backhoe, bulldozer etc.) with related risks of accidental spillage. To avoid any leakage when refuelling on site, the contractor will be required:

- To store fuel or engine oil (as well as any other hazardous product as paint or solvent) in dedicated storage areas compliant with applicable good practice: storage bottom waterproof surrounded by a bund providing a safe retention capacity in case of accidental spillage or leakage of at least 110% of the largest container stored. The storage area shall be covered to be protected from the rain.
- To set-up a refuelling procedure for mobile equipment involving (1) the use of leakage-collection equipment, (2) a training program for the workers in charge of refuelling, (3) the availability of spill clean-up materials (e.g., absorbent pads, fine sand, etc.) specifically designed for petroleum products, and (4) the availability of an extinguisher.
- To train relevant construction personnel in handling of fuels and spill control procedures.

5.4.7 IMPACTS ON WATER RESOURCES QUALITY AND USE

Source of Impacts

There is no project component anticipated along the Thanlwin or the Attran rivers so no particular impact is expected on river water quality. The project anticipates developing a water treatment plant (WTP) next to the existing KhinPonChong reservoir from which the water will be pumped. A water intake shall be developed on the reservoir to supply the WTP and to replace the existing intake. The intake shall be a floating structure, so excluding heavy earthworks within the reservoir boundary. However it may involve some activities on the reservoir shoreline, with potential water pollution risks. The risk of accidental spill of chemical (diesel, oil,



paint) as well as the increased turbidity of the water during works in the water or just nearby could happen if no preventive measure is implemented by the contractor.

- Release of suspended sediments during limited excavation works required for the laying of the pipes between intake and WTP on the shoreline of the reservoir;
- Chemical contamination by leakages of engine oil, hydraulic fluids or fuel from the machinery during works;
- Biological contamination from the workers;
- Release of solid waste from the workers.

Works for rehabilitation of the existing water supply network, particularly the change of the main pipes, may alter the quality of the water distributed by increasing temporarily sediment load or by creating contamination sources.

Mitigation Measures

The contractor shall be required the following prevention measures for works carried out adjacent to river body:

- Ensure equipment used for works is free of leaks and excess oil or grease
- Storage of fuel and chemicals and equipment refuelling operations shall be organized at least 50 m away from the water body on an efficient retention storage facility;
- The contractor shall submit an emergency plan in case of accidental spillage of hazardous product into the reservoir, describing the measures it intends to take in case of such event.
- Carry out the earthworks during dry season to avoid sediment run-off to the KhinPonChong water body;
- Minimize disturbance of vegetation on surrounding areas. Cut brush off to ground height where needed but without disturbing the roots, to allow vegetation regrowth from root stocks and reduce risk of erosion and sediment transfer to the reservoir.
- When muddy water is pumped from excavation works related to the construction of the WTP foundations, it shall be transferred into a sediment trap or pond to collect as much as possible sediment before discharging returning water in natural drains or in the reservoir. Even better, discharge water into vegetated area for eventual infiltration into the ground;
- Equipment shall be washed in a dedicated area located at least 30 m from the water body and the resulting wastewater (including grease, oil or cement) collected in a sediment pond.

For rehabilitation works on the main water supply network system, methods shall be selected to avoid risks of contamination of water supplied. Prevention of earth and wastewater or any contaminated water or chemicals from entering the distribution system shall be implemented. Training of workers shall be required to ensure the respect of the specific measures to be developed.

5.4.8 IMPACTS ON CULTURAL HERITAGE RESOURCES

Source of Impacts

Several monasteries and pagodas are distributed all over the city. Also, several buildings dating from the British period provide Mawlamyine with a distinct character from other cities. Setting up a financing system to promote their rehabilitation by their respective owners and the rehabilitation of the Township Administrative Office Building are proposed as a component of the present project. None of the religious or cultural heritage buildings identified shall be affected by the construction works related to water supply or solid waste management components.

However, even if no valuable physical cultural resource has been identified from the project sites, impacts on archaeological relicts may still happen, particularly during earthwork excavation in the streets for the rehabilitation of the water supply network.

Mitigation Measures

The following measures shall be implemented by the Contractor:

- For any works carried in streets following religious and cultural heritage buildings, a protection of the surrounding walls shall be put in place in the areas the closest to the works. The protection shall consist of a mobile fence to ensure at least 1m safety distance between works and the preserved structure. This safety distance shall also be used for the passage of pedestrians.
- No activity generating vibrations shall be authorised next to a cultural heritage building to avoid any risk of degradation. Appropriate equipment and methods shall be implemented in such places.
- Any time, to dispose earth, materials, pipes, equipment etc. directly against a heritage structure (or its surrounding wall) shall be strictly forbidden.
- The owner of the building or the monk community and the government heritage staff concerned shall be informed of the measures imposed to the contractor and will ensure these are enforced 24/7 during the works. In case of breach with these obligations, the PMO shall be contacted for immediate corrective measure.

The contractor shall implement a "chance to find" procedure throughout the construction works to account for any undiscovered items identified during construction/excavation works. The procedure shall include the followings:

- Workers will be trained in the location of heritage zones within the construction area and in the identification of potential items of heritage significance. This training shall be provided by an experienced professional in cultural heritage;
- Should any potential item be located, the site supervisor will be immediately contacted and work will be temporarily stopped in that site.
- If the site supervisor determines that the item is of potential significance, a representative from the Department of Archaeology and National Museum (DANM, Ministry of Culture) or from the Mawlamyine University shall be invited to inspect the site and work will be stopped until he has responded to this invitation.
- Work will not resume in this location until agreement has been reached between Mon State Government and DANM of Mawlamyine as to any required mitigation measures, which may include excavation and recovery of the item.

- A precautionary approach shall be adopted in the application of this procedure.

5.4.9 HEALTH AND SAFETY OF WORKERS

Source of Impacts

The project will concentrate a number of workers, mostly recruited from Mawlamyine. Inappropriate accommodation or food quality may result in communicable diseases and outbreak of water, hygiene and mosquito related infections. Inappropriate safety conditions on construction sites may lead to accidents, muscular diseases and eventually fatalities. Issue of occupational health and safety (OHS) is a major one in Myanmar, where these aspects are hardly considered on most construction sites observed. It may also represent a risk for the surrounding community if construction sites are not sufficiently fenced.

Mitigation Measures

To ensure appropriate health and safety conditions for the workers, and in compliance with the requirements of the ADB or any other international lending Agency, a Health and Safety Management Plan shall be prepared by the concerned contractors and shall be non objected by the PMO. The Plan shall be designed to ensure that Burmese labour regulations and international good practices (ILO, IFC ESHS Guidelines) related to health and safety are complied with and measures efficiently implemented on site. This Plan shall also be considered as a pilot experience for the Mawlamyine municipality to be systematically replicated for further construction projects.

The OHS Plan will address the following obligations:

- To identify health and safety hazards associated with construction activities (e.g., working at heights, work in confined space, permits to work, excavations and trenching, etc.), establishment and operation of construction/worker's camps, use of heavy equipment, transport and handling of materials and hazardous products (fuel);
- To propose for each potential risk appropriate and realistic prevention measures;
- To appoint an Environment, Health and Safety (EHS) Coordinator to look after implementation of required EHS measures, and to ensure the safety of the public in the vicinity of construction areas;
- To conduct awareness training for construction workers regarding occupational health and safety measures, hygiene, emergency response in case of accidents, fire, etc., and prevention of water related diseases;
- To provide first aid facilities in all working sites, particularly in those located outside the urban area: first aid kits in sufficient numbers with content complying with OSHA standard No. 1910.266 App.A, first aid officer present any time on site during working hours (at least 1 first aid officer per shift of 10-50 workers), first aid officer and stations clearly identifiable on sites;
- To provide fire-fighting equipment (extinguishers) on the work sites;
- To provide adequate accommodation for all workers living in a worker camp including building of acceptable quality, room size, sleeping equipment (bed, mattress, sets of bed sheets and blanket, mosquito net, storage area, light etc. ESHS specifications for bidding documents will elaborate in detail on all these



requirements. It is anticipated that the worker camps will accommodate only a limited number of workers as most of them should be resident in Mawlamyine and should not require accommodation in camps;

- To provide reliable supply of potable water on work sites and in camps controlled at least on a weekly basis for residual chlorine and coliforms;
- To provide separate hygienic sanitation facilities/toilets and bathing areas with sufficient water supply for male and female workers.
- To establish clean canteen/rest area.
- To ensure proper collection and disposal of solid wastes produced within the construction and camp sites.
- To provide solid fencing on all areas of excavation greater than 1 m deep. For all worksite areas without excavation, provides movable barriers to prevent accident with surrounding residents.
- To provide personnel protection equipment (PPE) appropriate to the job: at least helmets and safety boots to all workers, and depending on job safety risk, to provide also gloves, protective clothes, goggles and ear protection and ensure the equipment is effectively and adequately used.
- To ensure reversing signals are installed on all construction vehicles.
- To implement fall prevention and protection measures whenever a worker is exposed to the hazard of falling more than two meters, or falling into operating machinery or of falling through an opening in a work surface. Based on a case-specific basis, fall prevention/protection measures may include installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area, proper use of ladders and scaffolds by trained employees, use of fall prevention devices, including safety belt and lanyard travel limiting devices to prevent access to fall hazard, fall protection devices such as full body harnesses, etc.
- To secure all construction sites inside urban areas from entering for the surrounding population and particularly children.

5.4.10 SUMMARY OF IMPACTS AND MITIGATION MEASURES

The table below summarizes the impacts identified and the corrective measures proposed for the Third GMS Project Components during the construction period. For the meaning given to the evaluation of the impact, see Section 5.1: Methodology for Impact Assessment.

IEE REPORT-MON STATE-JUNE.2016

TA 8758 – Preparing Third GMS Corridor Towns Development

Table 5-5: Potential Impacts and Mitigation Measures related to Project Construction

COMPONENT OR ACTIVITY	POTENTIAL RISKS	DESCRIPTION OF POTENTIAL IMPACT	IMPACT ASSESSMENT			CORRECTIVE OR SUPPORT MEASURE	EASENESS OF IMPLEMENTATION	OVERALL RISK AFTER CORRECTION
			PROBABILITY	GRAVITY	OVERALL RISK			
Land preparation	Excessive destruction of trees	Limited impact for the whole project. Construction of the WTP and the linked storage involves only 4.4 ha (1.1 acres) of open scrubland type vegetation. Water supply network component may only impose occasionally tree cutting in the streets for pipe laying. About 19.4 ha of open scrubland located around the existing landfill shall be used for the new landfill facility. Secondary vegetation only with mainly small trees.	3	1	1	Monitoring of tree cutting by PIC, and maximization of conservation	1	1
			3	1	1	Mitigation greening program considering at least 2 trees planted for 1 mature tree cut. Consider plantation of a greenbelt around the landfill, at least 10 m width using fast growing trees as Eucalyptus or any other native fast growing species, to create a buffer zone with surrounding development areas.	1	1
	Destruction of protected species	Based on literature and direct observation, none of the species identified in Mawlamyine has a status of protected species (national or international)	1	2	1	Vigilance of the PIC during land preparation activities	1	1
	Interference with compensation & resettlement	Construction works start while land acquisition is not completed, raising conflicts with concerned owners.	1	3	2	Procedure with issuance of a land access certificate by PMO as a prerequisite for authorizing contractor to access the land. Monitoring by PIC of compensation progress and of issuance certificate	2	1
Workers' camps	Pollution of surface water and groundwater	Wastewater discharged into the environment	3	2	2	Wastewater receives treatment before being released outside premises in compliance with MONREC domestic effluent standards	2	1
						Contractor to monitor the quality of effluents released outside the bounds of the camps	2	1

IEE REPORT-MON STATE-JUNE.2016

TA 8758 – Preparing Third GMS Corridor Towns Development

COMPONENT OR ACTIVITY	POTENTIAL RISKS	DESCRIPTION OF POTENTIAL IMPACT	IMPACT ASSESSMENT			CORRECTIVE OR SUPPORT MEASURE	EASENESS OF IMPLEMENTATION	OVERALL RISK AFTER CORRECTION	
			PROBABILITY	GRAVITY	OVERALL RISK				
	Zones of stagnant water	Proliferation of water-borne disease vectors (mainly dengue fever and malaria, highly prevalent in Mawlamyine)	2	3	2	Create and maintain ditches to ensure efficient drainage and drain all stagnant water zones in camp	2	1	
						Regular treatment of living areas with pesticide in compliance with authorised pesticides in Myanmar and EHS IFC guidelines			
	Health risks	Development of diseases among workers because insufficient hygiene in camps and construction sites		2	2	Systematic awareness sessions for all new arrivals at the camp: meetings, posters in circulation areas, monitored by the camp chief	1	1	
						Prevention by automatic medical check-up at hiring			
	Workers' living conditions	The most serious impact would be the contractor not providing acceptable housing and subsistence for workers.		2	2	Monitoring of hygiene conditions at the camps	1	1	
						Anti-malarial prophylaxis, including mosquito netting			
						Include detailed specifications on camp equipment and management in the tender documents. Enforce contractor obligations on site by regular site inspections (PIC)			
	Non-potable water supplied to workers.	Impact on public health, risk of epidemic. Main risk at the WTP site and landfill site where worker camps may be installed. Other project components located within urban areas, where camp facilities may not be required. However, water supplied on construction sites may also be of bad quality with impacts on worker's health	1	3	2	Tender documents to define obligations of contractors regarding supply of potable water in camps and on construction sites.	1	1	
						Contractor and PMO to regularly monitor coliforms or residual chlorine (if not industrial drinking water bottles supplied) by reference to MONREC/WHO standards			
	Workshops and garages	Such facilities should not be required in the urban area. One workshop may be installed near the landfill component considering extent of civil works. Storm water drainage contaminated by pollutants (mainly oil & grease)	3	2	2	Drains of workshops and garages equipped with oil separators	1	1	
						Properly store hazardous products (including hydrocarbons). See activity "Use and storage of hazardous products"			
						PMO to monitor and control used oil: Monitoring registers/logs and dedicated storage areas.			

IEE REPORT-MON STATE-JUNE.2016

TA 8758 – Preparing Third GMS Corridor Towns Development

COMPONENT OR ACTIVITY	POTENTIAL RISKS	DESCRIPTION OF POTENTIAL IMPACT	IMPACT ASSESSMENT			CORRECTIVE OR SUPPORT MEASURE	EASENESS OF IMPLEMENTATION	OVERALL RISK AFTER CORRECTION
			PROBABILITY	GRAVITY	OVERALL RISK			
Excavations in urban area	Loss of cultural resources	Possible archaeological physical resource discovery during excavation work with the total loss of the relic if special measures are not taken.	1	2	2	Put in place a "Chance to Find" procedure aimed at halting work and warning the supervisors and the national authorities concerned for conservation measures to be taken to preserve the discovery and restart work as quickly as possible. Ensure personnel are aware of the procedure.	1	1
Hazardous waste management	Water and soil pollution	Located in urban area, most truck maintenance will be done in private garages. Only heavy machinery will receive basic maintenance and refuelling on site. Limited volumes of used engine oil and used hydraulic oil will be produced on site and will need appropriate storage to avoid soil and water pollution	3	2	2	Require the contractor to prepare a hazardous waste management plan explaining where and how he will manage used oils	1	1
						Use storage sites that meet safety standards (with retention)	2	1
						Identify the existing used oil recycling facilities in Mawlamyine (none identified so far except re-use as paint for wood houses)	1	1
						Contractor to maintain a log of production/recycling of used oil	1	1
Production of non-hazardous solid waste	Water and soil pollution	By domestic waste: Possible impact if the waste is not managed in line with best practices in the worker camps and construction sites.	3	2	2	Contractor to submit a Solid Waste Management Plan including methods and procedures for (i) Awareness training of workers, (ii) collection and storage of waste on project sites, (iii) selective collection and recycling of waste (iv) eventual collection and disposal of waste, (v) coordination with MTDC/Mawlamyine Township Development Affairs Committee/ Mawlamyine Cleansing Department	1	1
		By construction waste: Limited risk for inert products which may be associated to the fill for other project components				Ensure recycling of metals, plastics and glass	2	1
Concrete production	Water pollution	Typical impact is water pollution by the alkaline wastewater from equipment and concrete trucks cleaning. This may concern the WTP and the intake at KhinPonChong reservoir	2	2	2	Install a sedimentation pond with pH buffering before release of water in the natural drainage system	2	1
						Contractor (and PIC) to monitor the quality (SS, pH) of effluent released	1	1

IEE REPORT-MON STATE-JUNE.2016

TA 8758 – Preparing Third GMS Corridor Towns Development

COMPONENT OR ACTIVITY	POTENTIAL RISKS	DESCRIPTION OF POTENTIAL IMPACT	IMPACT ASSESSMENT			CORRECTIVE OR SUPPORT MEASURE	EASINESS OF IMPLEMENTATION	OVERALL RISK AFTER CORRECTION
			PROBABILITY	GRAVITY	OVERALL RISK			
Spoil Disposal	Excessive use of productive land to dispose the spoil	Sediment dredging is anticipated from KhinPonChong reservoir.	3	1	1	Contractor shall identify surrounding development projects involving land reclamation in low lying areas which could benefit the availability of spoil.	-	-
		Spoil from landfill construction to be disposed over productive land	2	2	2	Spoil could be stored on the landfill area for use as cover soil for waste during landfill operation	1	1
Road Traffic	Public safety	Risk of road accidents related to truck traffic increase in urban zones for the transport of equipment and materials. Limited increase is anticipated as works will require limited quantities of materials/equipment (2	3	2	Selected hauling routes and preventive/monitoring measures to be presented by the contractor in the Road Traffic and Access Plan	1	1
						Monitoring of driver behaviours in relation with Police Department	1	1
	Risk of traffic disruption in urban zones	Most sensitive areas in small streets concerned by rehabilitation of water supply network.	3	2	3	Road Traffic and Access Management Plan to be prepared by contractor shall detail procedures for traffic management: coordination with police, public information, signs and safety etc.	2	1
	Air pollution	Excessive exhaust gas emissions	3	2	2	Keep engines serviced	2	1
		Production of dust	3	2	2	Speed control, regular sprinkling of sensitive urban areas and on construction sites, cleaning of truck wheels when exiting muddy sites	2	1
Handling hazardous products	Fire risk	Related to the storage of flammable products: hydrocarbons, paints, solvents. Potential risk on most sites involving heavy machinery	1	3	2	Provide fire equipment (extinguishers, fine sand) and safety posters displayed at each site.	1	1
	Set up a safety procedure and awareness/training for personnel concerned.	1				1		
	Risk of accidents to personnel	Skin burning during handling operations, but risks quite limited for such type of project (few hazardous products required)	1	3	2	Provide training for personnel plus personal protective equipment and onsite safety data sheets for the products concerned	1	1

IEE REPORT-MON STATE-JUNE.2016

TA 8758 – Preparing Third GMS Corridor Towns Development

COMPONENT OR ACTIVITY	POTENTIAL RISKS	DESCRIPTION OF POTENTIAL IMPACT	IMPACT ASSESSMENT			CORRECTIVE OR SUPPORT MEASURE	DESCRIPTION OF MEASURE	EASINESS OF IMPLEMENTATION	OVERALL RISK AFTER CORRECTION
			PROBABILITY	GRAVITY	OVERALL RISK				
	Water pollution	Potential risk of accidental spillage: Leak in a storage tank, accidental spillage when handling or refuelling engines, road accident when transporting hydrocarbons.	2	3	2	Contractor to prepare hazardous products management plan, in particular: Store using containment trays, measures for preventing and detecting leaks and accidental spills, register/log of hazardous products and their use, antipollution equipment.		2	1
						Emergency response procedure in the case of accidental spillage		2	1
						Special safety procedures for refuelling engines		1	1
All Components and Activities	Occupational Accident of workers	As observed on on-going construction sites in Mawlamyine, occupational safety of workers is almost nonexistent, with high risks of injuries and accidents during construction activities	3	3	3	Contractor to prepare and enforce a Health and Safety Plan to describe organisation, prevention and measures in case of accident. Particular attention dedicated to measures in urban areas (rehabilitation/extension of water supply network)		2	1
						Obligation of Personal Protective Equipment (PPE) for all workers on project sites, minimum being helmet and safety shoes		2	1
						Main contractors to designate a HSE Coordinator to ensure safety measures are enforced on sites		2	1
						Regular construction site inspections of PIC		1	1

5.5 Impacts during Operation stage

5.5.1 IMPACTS ON/FROM FLOODING

None of the components of the Project in Mawlamyine is implemented in a floodable area (even considering the long term situation with sea level rise because of climate change) or may generate flooding because of its location or its operation. The improvement of solid waste collection will have direct beneficial impacts on urban drainage which is presently severely clogged by dumped waste, resulting in localised flooding during heavy rainfall events.



DRAINAGE CLOGGED BY DOMESTIC WASTE...



...AND BY UNCONTROLLED WATER SUPPLY PIPES

5.5.2 IMPACTS ON UNDERGROUND WATER RESOURCES

The water supply component of the project relies on surface water sources and does not exploit underground resources. As such, no impact related to overexploitation of underground resources is anticipated from the Project. In the long term, the Project may have indirect beneficial impacts on the underground water resources:

- The water supply component will significantly increase the water supply of the population both in terms of duration of service, volumes and quality of water. Considering that presently people rely partly on low quality underground water (from shallow wells) and on septic tanks for their sanitation, the project will increase the volume of water released to the soil by septic tanks and eventually reduce the dependency on shallow wells, thus improving aquifer recharge;
- The solid waste component will drastically increase the quantity of waste collected (from 24 500 t/year in 2015 to 65 900 t/year in 2040) and safely disposed in a controlled landfill. At landfill site, leachates will be collected and treated. This component will definitely reduce the pollution load from solid waste which presently percolate into the soil and affects the underground water quality.

However, if leachates from waste piles is not appropriately collected and treated before being released in the environment it may have significant impacts on underground water quality with health threats for the surrounding population relying on shallow wells.

The project design as presented in the Project description Section of this report fully considers this risk and provide for a full collect, treatment and disposal process for the leachate:

- The landfill cell bottom and side slopes will be fully covered by an impervious liner made of high density polyethylene (HDPE) minimum 1.5 mm thick with sheets welted together by a specialized company;
- A drainage system will cover the bottom of the cell including layers of gravels of various grain size with a network of drainage pipes to collect the leachate;
- The leachate will be transferred into an on-site treatment process including physical treatment (sedimentation, settling pond) and biological treatment (oxidation pond);
- Environmental monitoring includes 6 groundwater monitoring wells, 1 well up-gradient of the groundwater flow and 5 wells along the sides in down gradient direction, all wells 30 m away from landfill;

The organic load of the leachate shall be reduced as a part of the biodegradable waste will be diverted to the composting plant to be developed on the landfill site. The composting plant will have a design capacity of 65 t/day, for the treatment of 25% of the generated waste till 2025. In a second stage, the target is to compost 40% of the generated waste with a capacity of 120 t/day. Composting pad, maturing pad and storage pad will be covered, reducing the volume of leachate produced. Leachate produced by the composting plant will be drained and transferred to the leachate treatment facility.

Compost production is intended to be used for agriculture or green urban areas. To maximize the usability of end products (compost), waste should not be accepted that contains organics that are contaminated by potentially hazardous chemicals (e.g., PCBs, chlordane and other pesticides, heavy metals and metalloids) and/or pathogenic substances and micro-organisms (e.g., prions, viruses, bacteria, and parasites) that will not be rendered harmless by the process or may constitute a health or environmental risk. This may include certain clinical waste and other related wastes of clinical origin, and diseased carcasses, or contaminants classified as hazardous or industrial wastes.

5.5.3 IMPACTS ON SURFACE WATER QUALITY

The solid waste component of the Project will have major impact on surface water which is, presently the main receiving body for most of the solid waste generated by Mawlamyine. At the existing dumping site, leachates are presently released into surface water without any treatment. The drastic improvement of solid waste collection and disposal will definitely reduce the pollution load to the drains and eventually to the Thanlwin River.

Waste will be weighed at entrance on the landfill site, then discharged on a platform for sorting and segregating the waste: organic waste to be directed to the compost plant, recyclable waste, hazardous waste (including infectious waste from hospital and clinics) and other dangerous items (gas containers, explosive products, etc.).

Water treatment plant will generate sludge from the treatment process, with potential but very limited risk of pollution of water resources. The volume produced will be limited as the KhinPonChong reservoir presents a low TSS during rainy season of about 60 mg/l, probably not exceeding 30 mg/l during dry season. For a production of 8 000 m³/day, the maximum sludge production represents only about 500 kg dry matter per day or less than 0.4 m³/day, a volume which can be easily stored temporary on site before regular delivery to the landfill, where it can be used as daily soil cover. This value shall probably be divided by at least 2 during dry season. This sludge will consist mainly of mineral material, and shall not represent any risk of toxicity as no industry or urbanised area discharge into the catchment of the KhinPonChong reservoir and also because the low SS load shall not require any flocculation stage in the process.

Treatment of water at WTP level will rely on liquid chlorine. Liquid chlorine may involve a risk of accidental spill. This risk shall be mitigated by a dedicated storage area with an active retention capacity of at least 110% of the largest container capacity stored on site. Dedicated safety training shall be organised for the workers in charge. No residents in the immediate vicinity of the plant.

Measures for the protection of the resource shall also be implemented. The catchment of KhinPonChong reservoir is of small size and not populated. Only few tree plantations are observed. No industry is located in the catchment. It is required to ensure this situation will be preserved in the future.

- Ensure that treatment capacity is adequate to meet anticipated demand;
- Construct, operate and maintain the water treatment facility in accordance with national requirements and internationally accepted standards²⁶ to meet national water quality standards or, in their absence, WHO Guidelines for Drinking Water Quality ;²⁷
- Evaluate the vulnerability of the treatment system and implement appropriate security measures, such as:
 - Background checks of employees
 - Perimeter fencing and video surveillance
 - Improve the electrical power feeds to the facilities
 - Redundant electrical power systems significantly reduce the vulnerability risk to essential operations.

5.5.4 IMPACTS ON URBAN ENVIRONMENT AND QUALITY OF LIFE

The Project components will eventually contribute to a healthier and cleaner urban environment. Improvement of water supply capacity, rehabilitation/extension of networks and supply of treated water will reduce the population dependency to private or public shallow wells, most being significantly contaminated, and reduce population expenses related to the purchase of drinking water bottles. Improved collection of waste will contribute to reduce the risk for waterborne diseases among the population and will contribute to improve public health conditions of diseases transmitted through insects or rodents. Improvement of waste collection shall drastically improve the cleanliness of the city.

5.5.5 IMPACTS ON GHG EMISSIONS

METHODOLOGY

Green House Gas (GHG) will be produced during construction and operation of the project components, water supply and solid waste management improvement. GHG production shall be limited during construction for both components, mainly related to exhaust fumes from trucks and other thermal machinery relying on diesel.

During operation, the water supply component shall also release some quantities of GHG, mainly related to the use of electricity for pumps and treatment plant operation and to the transport of residual treatment sludge to the landfill. The amount released by such activities will be very limited.

However, GHG emissions from conventional solid waste management in Asian countries are considered to contribute significantly to global climate change: methane (CH_4) emission from open dumping and landfilling is considered the third highest anthropogenic methane emission source (IPCC, 2006). These two processes are currently the most common waste treatment methods in Asian countries. In addition, GHG emissions (e.g. CO_2 , N_2O) from waste handling, transportation and operation of machinery contribute also in GHG emission, but at a much modest level. Depending the treatment processes considered, there is a possibility for important indirect GHG savings through materials and energy recovery from waste management which may even result in global GHG emission avoidance.

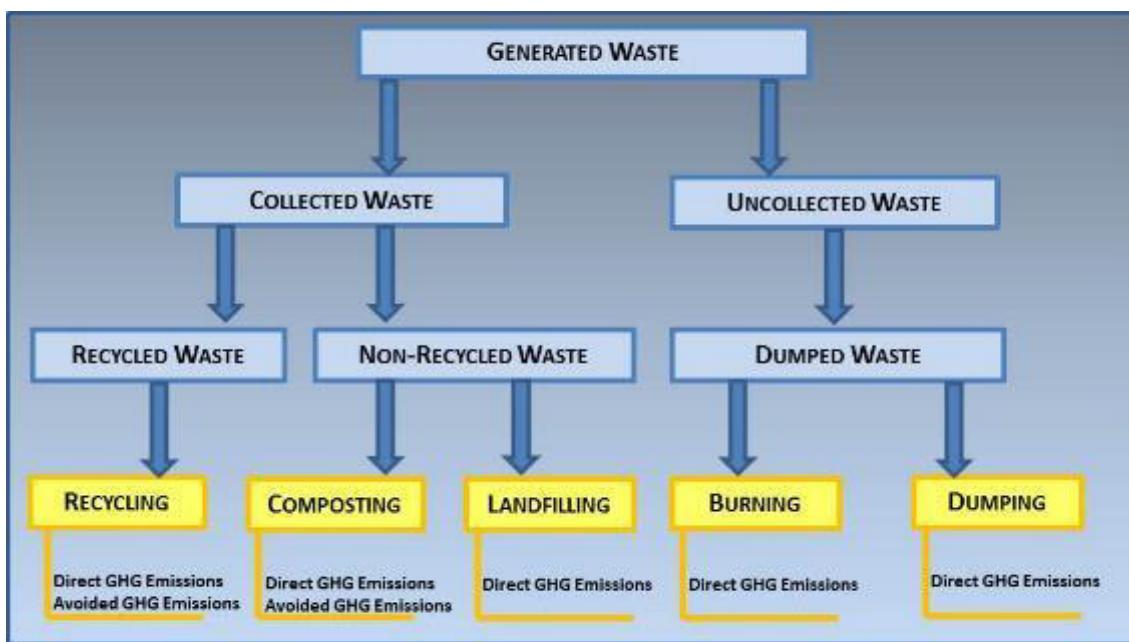
Thus, this section focusses mainly on GHG emissions from waste management components, as they shall provide most of the future emissions from Project components.

Simulations carried out by the PPTA Consultant to quantify GHG emissions from various waste management technologies rely on the IPCC 2006 guidelines from which the Institute for Global Environmental Strategies (IGES) simulation model was developed. The simulation calculates both the total GHG emissions and total GHG avoidance potentials of individual technologies. Based on the total GHG emissions and avoidance values, net GHG emissions are calculated from all the individual technologies considered in the Project.

The net GHG emission value reflects the overall climate impact/benefit of a particular technology taking into account the impact of all the possible resource and material recovery from the waste.

The simulation performed relies on the type of waste distribution in the municipal solid waste (MSW) and on the eventual treatment or disposal of the waste. The general waste processing organisation considered for simulations is presented in **Figure 5-1**.

Figure 5-1: Organization of GHG Simulations for MSW



Source: PPTA Consultant, 2015

In addition to these various processes for which GHG emissions and/or savings are estimated, an additional estimate is performed for waste collection and transport, mainly represented by the combustion of fossil fuel (diesel).

The main assumptions used for the estimate of waste types and quantities are those established by the PPTA Consultant in charge the waste management component and presented in the related Feasibility Study report. Assumptions regarding GHG production per unit of fossil fuel consumption and per unit of specific waste are those recommended by IPCC (2006) for the estimate of national GHG emissions. Decay equations are those recommended by IPCC (2006) and presented by the Institute for Global Environmental Strategies (IGES) from Japan in their Estimation Tool for Greenhouse Gas Emissions from Municipal Solid Waste Management in a Life Cycle perspective⁵.

Table 5-6: Main Sources and Values of References

TOPIC	SOURCE OR VALUES OF REFERENCE
Waste Collection and Transportation	Diesel consumption estimated in FSR Diesel Energy content: 36,42 MJ/l diesel Diesel GHG emission factor: 0,074 kg CO ₂ /MJ Uncollected waste is 53,17% of generated waste in 2015, 10% in 2020, 2% in 2040

⁵Tool developed by Nirmala Menikpura and Janya Sang-Arun under project « Measurement, Reporting and Verification for Low Carbon development in Asia » (2013)

Recycling	GHG emission based on recycling emissions from fossil fuel and electricity consumption from Thailand; Avoided emissions also based on energy required from related material production in Thailand (paper, aluminium, plastic, glass, metal) Recycling is 16% of generated waste in 2015 and 20% from 2020
Managed Landfill	Landfill gas: 60% methane and 40% CO ₂ Equations regarding decay according to IPCC 2006 Waste Model Model considers emission without/with gas collection & flaring Waste disposed to landfill is equal to collected waste minus recycled and minus composted fractions
Composting	IPCC default emission factors: 4kg CH ₄ and 0,3 kg N ₂ O/ton organic waste (wet basis) Electricity: basis is Thailand grid emissions of 566 kg CO ₂ eq/MWh Composted waste is 25% of generated waste in 2020 and 40% from 2025. 90% of the compost produced is re-used for agriculture or urban gardening as fertilizer substitute
Dumping	Similar to managed landfill but it considers more shallow deposits (<5m) and no collection of landfill gas. Fraction dumped in various locations of the city equivalent to uncollected waste, with 70% decaying as in shallow landfill (<5m)
Burning	Model considers only emission of CO ₂ Quantity burnt is estimated as 30% of uncollected waste.

RESULTS

Results from the assessment are provided for Mawlamyine for years 2015, 2020 and 2040 in **Table 5-7**.

Table 5-7: GHG Emissions from MSW for Mawlamyine

GHG EMISSIONS (IN TONS CO ₂ -EQ/YEAR)	2015	2020	2040
Emissions from Collection & Transportation of waste			
Direct Emissions from fossil fuel consumption	48	98	157
Net GHG Impact/Benefit	48	98	157
Emissions from Recycling of waste			
Direct Emissions from recycling	11501	23904	51641
Avoided emissions from material production	-21290	-44251	-95598
Net GHG Impact/Benefit	-9790	-20347	-43957
Emissions from Composting of waste			
Direct Emissions from Plant Operation	N.A.	78	155
Direct Emissions from waste degradation	N.A.	3424	11836
Avoided emissions from fertilizer production	N.A.	-12323	-63781
Avoided emissions from organic waste landfilling	N.A.	-8997	-66085
Net GHG Impact/Benefit	N.A.	-17818	-117876
Emissions from Landfilling of waste			
Emissions of Methane Gas	763	1126	1761
Emissions of Methane with gas flaring	N.A.	225	352
Direct GHG emissions without gas flaring	16024	23693	37060
Direct GHG emissions with gas flaring	N.A.	4731	7473
Net GHG Impact or Benefit (with flaring)	N.A.	4731	7473
Net Total GHG Emissions from Collected waste	6283	-33336	-154202
Emissions from Uncollected Waste			
Emissions from uncontrolled dumping	8672	2613	1230

GHG EMISSIONS (IN TONS CO ₂ -EQ/YEAR)		2015	2020	2040
Emissions from waste burning	1895	148	13	
Net GHG Impact or Benefit	10567	2762	1242	
Net GHG Emissions from Generated Waste	16 850	-30 574	-152 960	

Source: PPTA Consultant

At present, the highest contribution to GHG is coming from collected waste dumped in Mawlamyine landfill (16 000 t CO₂eq/year). Fortunately, this figure is buffered by the avoided emissions from the recycled waste, almost 10 000 t CO₂eq/year. Uncollected waste GHG emission is in a similar range with about 10 000 t CO₂eq/year. The annual balance is a net emission of 16 850 t CO₂eq/year.

With the project components, which intend to strongly reinforce waste collection, promote recycling and composting and develop a sanitary landfill with gas collection and flaring, the yearly balance shall be strongly beneficial, **with a GHG net benefit of about 30 000 t CO₂eq/year in 2020 and 153 000 t CO₂eq/year in 2040**. This beneficial situation results from major emissions avoidance related to recycling and mainly to composting. **Flaring of landfill gas (60% methane) provides also a major reduction of GHG emissions from the managed landfill with 80% abatement.**

In a project duration perspective, the benefits of the proposed Project regarding GHG emission/avoidance are considerable. Cumulated emissions and avoidances from MSW in Mawlamyine are presented in Section 6.

5.5.6 IMPACTS ON AIR QUALITY AND NOISE

The project shall have beneficial impacts on Mawlamyine air quality. Indeed, the large volume of rotting organic solid waste dumped in any possible place around the urban area contributes to release unpleasant gas. The several collection points with only degraded containers (or without container) are also places generating smell nuisances to the surrounding population. The several points in the city, where such dumped waste is burnt, release smoke and unpleasant smells. The solid waste component will improve this situation: improving the waste collection will reduce the volume of waste dumped into the drains and open spaces of the city where it either rot or is burnt. The new transfer points proposed will be equipped and managed to reduce gas emission: shorter transit time for the waste, closed containers, closed trucks.

However, handling of solid waste during the collection and disposal process may generate nuisance dust but also bioaerosols (i.e., particles in the air consisting wholly or partially of microorganisms). Bioaerosols are of particular concern to the health of waste workers and have been shown to be the source of reduced pulmonary function and increased respiratory disease for those in immediate proximity to waste sweeping and collection activities. Recommended management strategies to minimize dust, bio-aerosols, and odours include:

- Establishing frequent waste collection schedules;
- Instituting a washing program for waste collection vehicles and for company-owned waste collection and transfer containers;

- Promoting the use of bags to reduce the odours from soiling of waste collection and transport equipment.
- Cover collection and transfer vehicles along the entire route of transport to avoid windblown litter;
- Clean vehicles used for waste hauling before transportation of any goods, including compost;
- Encourage residents to put waste out at designated times and locations;
- Where possible, blocking off access to dumping sites and fining illegal dumpers.

Specific measures to prevent, minimize and control vehicle air emissions during waste collection and transport include the following:

Optimize waste collection routes to minimize distance travelled and overall fuel use and emissions

Waste collection and transport vehicle owners and operators should implement the equipment manufacturers' recommended engine maintenance, along with the mechanical maintenance for the safe operation of the vehicle, including proper tire pressure. ;

Drivers should also be instructed on the benefits of driving practices which reduce both the risk of accidents and fuel consumption, including measured acceleration and driving within safe speed limits (working with garbage truck drivers can save as much as 25% on fuel use and reduce maintenance by 15%).

Additional fleet management recommendations are presented in the General EHS Guidelines.

The following measures are recommended to prevent, minimize, and control vehicle emissions and emissions of dust, odours, and bioaerosols during waste receipt, unloading, processing, and storage:

- Select vehicles and containers that minimize air emissions during waste loading and unloading;
- Design drop-off points to minimize queuing of vehicles;
- Sweep waste management areas and roads frequently and use water spray for dust control where needed;
- Pre-treat wastes as needed (e.g., solidification, encapsulation, or wetting sufficient to reduce dust but without forming leachate);
- Use enclosed waste handling and storage areas for malodorous wastes or wastes that generate hazardous dust (e.g., asbestos). Enclosed waste storage and handling areas are preferred for all wastes;
- Use extraction system to remove dust from working areas, buildings, and storage vessels, and treat as needed to control particulate emissions (e.g., bag filter);
- Remove, treat, or dispose of all biological/malodorous wastes in an expeditious manner;
- Use odour-neutralizing sprays where necessary;

- Use negative pressure in processing buildings and appropriate air filtration (e.g., bio filter) to remove odour

In addition, annual medical check-up shall be organized for all waste workers involved in waste collection and in activities on the landfill. Principal sources of noise and vibration include truck traffic, loading equipment (e.g., cranes, wheeled loaders), stationary compactors, balers, grinders, and other treatment and conveyance systems.

Recommended noise management strategies include:

- Construct a buffer zone between the facility and the external environment or locate facilities away from sensitive receptors;
- Include noise and vibration considerations during design, including use of models to predict noise levels at specified noise-sensitive locations, using standardized sound power levels for construction plant;
- Maintain site roads in good condition to reduce noise and vibration from vehicle movements;
- Use acoustic screens around fixed/mobile plant and equipment;
- Select equipment that has low noise emission levels;
- Fit silencing equipment to plant, e.g. baffles/mufflers;
- Use buildings to contain inherently noisy fixed plant equipment (e.g., locate waste shredder in the tipping hall, and enclose tipping hall on all sides) and consider use of sound-insulating materials in construction.

Noise shall not be an issue when compared to the present situation. For waste, only the noise related to the carts and trucks transporting waste is expected. For the water supply component, no noise nuisance is expected as the distribution of water is by gravity and does not include the construction of any pumping station within the urbanized area. Both facilities (WTP and landfill) are located reasonably far from residential area (300 to 500m) and shall not create any noise disturbance at night.

5.5.7 SUMMARY OF IMPACTS AND MITIGATION MEASURES

Table 5-8 summarizes the potential operation impacts of the project components in Mawlamyine with proposed corrective measures.

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

Table 5-8: Summary of Impacts and Mitigation measures during Operation Phase

COMPONENT OR ACTIVITY	POTENTIAL EFFECT	POTENTIAL IMPACT	IMPACT ASSESSMENT			CORRECTIVE OR SUPPORT MEASURE			EASINESS OF IMPLEMENTATION	OVERALL RISK AFTER CORRECTION
		DESCRIPTION OF IMPACT	PROBABILITY	GRAVITY	OVERALL RISK	DESCRIPTION OF MEASURE				
Improved Water Supply Systems										
Construction of a WTP with disinfection stage	Quality of life and public health	Improved water supply security in Mawlamyine and improved public health	-	-	-	-			-	-
		Benefits from disinfection may be erased if disinfection not permanent or not strong enough to reach far points of network	2	3	3	Regular monitoring of residual chlorine and coliforms in the network, to confirm residual chlorine >0.5 mg/l Operation ensures permanent and appropriate level of disinfection Monthly monitoring of general drinking water parameters			2	2
	Surface water pollution	Risk of pollution by accidental spill of chlorine if chlorine solution is used	1	2	2	Storage area of liquid chlorine to ensure retention capacity of 110% of the capacity of the largest container on site; Regular monitoring of storage and container conditions Training of workers in charge of handling chlorine			1	1
		Pollution of surface water by inappropriate management of grid residues and sludge: Limited impacts anticipated according to limited volume of sludge produced (less than 0.5 m3/day as a maximum; sludge shall not be contaminated)	2	1	2	Ensure drying up of sludge and regular delivery with grid removals to the solid waste landfill			1	1
		Degradation of reservoir watershed and of KhinPonChong reservoir water	2	2	2	Ensure protection of this small catchment against residential and industrial development				
Rehabilitation of urban storages		The 3 storages of 2,200 m3 each shall be better protected against pollution: peripheral drainage and roofing; no particular impact or risk anticipated except the fast reduction of residual	2	3	2	Due to high temperature in Mawlamyine, and 1 day capacity of storage, control of residual chlorine recommended at storage level with possibility of additional chlorination if required			2	1

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

COMPONENT OR ACTIVITY	POTENTIAL EFFECT	POTENTIAL IMPACT	IMPACT ASSESSMENT			CORRECTIVE OR SUPPORT MEASURE			EASINESS OF IMPLEMENTATION	OVERALL RISK AFTER CORRECTION
		DESCRIPTION OF IMPACT	PROBABILITY	GRAVITY	OVERALL RISK	DESCRIPTION OF MEASURE				
		chlorine in water because of the high temperature in the region								
Rehabilitation of KhinPonChong water intake	None	No impact anticipated	-	-	-	No particular measure required			-	-
Creation of WS storage near KhinPonChong dam	Quality of life	Improved water supply security for Mawlamyine	-	-	-	No measure required			-	-
	Landscape	Storage shall be semi-underground with no impact on landscape	2	1	1	Ensure full revegetation of the site after works and particularly with trees) to dissimulate the storage. Rubber trees are recommended as surroundings are mainly occupied by rubber tree plantations.			1	1
Network Rehabilitation and Extension	Quality of life and public health	Increase of population serviced may decrease number relying on polluted shallow wells for drinking purpose	-	-	-	-			-	-
Climate Change	Affect water resources mobilised by the project	Risk of insufficient surface water resources is not anticipated because located in the wettest area of Myanmar and rainfall trend is increasing; As water source is not related to Thanlwin or Attran river, the risk of increased salinity because of CC is not of concern.	-	-	-	No particular measure required			-	-
	Increase of flooding risk	None of the facilities (WTP, storages) are located within floodable zones or zones which could be flooded in the long term.	-	-	-	-			-	-
Improved Solid Waste Management										
Improving waste collection	Impact on Water Quality and Drainage	Reduced quantity of waste discharged into the local drainage system and in the surface water bodies	2	2	2	The achievement of all these positive impacts depends on a major awareness campaign and capacity building on waste management among population of Mawlamyine			3	1

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

COMPONENT OR ACTIVITY	POTENTIAL EFFECT	POTENTIAL IMPACT DESCRIPTION OF IMPACT	IMPACT ASSESSMENT			CORRECTIVE OR SUPPORT MEASURE DESCRIPTION OF MEASURE	EASINESS OF IMPLEMENTATION	OVERALL RISK AFTER CORRECTION
			PROBABILITY	GRAVITY	OVERALL RISK			
	Impacts on Quality of life and Public Health	Improvement of drainage discharge capacities and reduction of localised flood risk, but risk of solid waste dumping continues by surrounding population, wasting efforts						
		General improvement of city image and quality of life of residents as a result of better waste collection rate	-	-	-			
		Risk of air nuisance if collection and transfer points not regularly cleaned	2	1	2		Cleaning procedure for collection and transfers points	2
	Impacts on Air quality	Reduction of waste presently dumped in the city shall reduce air pollution from gas, unpleasant smells and smoke from burnt waste	-	-	-		The achievement of all these positive impacts depends on a major awareness campaign and capacity building on waste management among population of Mawlamyine	-
	Reduction of pollution load	Collection point will improve waste segregation and management of hazardous waste from domestic origin	-	-	-		Organise and facilitate segregation on sites	1
Creation of a Sanitary landfill with composting plant	Impacts from smells and insects on surrounding population	The closest inhabited area is located about 300 m from the most SW boundary of the landfill. Risk of nuisance is limited as dominant wind direction is from SW.	2	1	2	Avoid locating a cell close to the extreme SW boundary of the landfill. Develop a green belt of trees around the landfill to preserve smells to be transferred outside at ground level Daily coverage of fresh waste by soil to limit insects/rodents		
	Release of GHG by the landfill and composting plant	Landfill and composting process release methane gas. However, when compared with the present situation, the project will create an abatement of GHG release estimated at 30 000 t CO2eq/year in 2020	-	-	-	No specific measure required		

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

COMPONENT OR ACTIVITY	POTENTIAL EFFECT	POTENTIAL IMPACT DESCRIPTION OF IMPACT	IMPACT ASSESSMENT			CORRECTIVE OR SUPPORT MEASURE DESCRIPTION OF MEASURE	EASINESS OF IMPLEMENTATION	OVERALL RISK AFTER CORRECTION
			PROBABILITY	GRAVITY	OVERALL RISK			
		and 153 000 t CO2eq/year in 2040. A major cause of abatement is related to the flaring of landfill gas. From 2016 to 2040, the project will avoid the emission of almost 2.13 million t CO2eq when compared to the situation without project.	-	-	-			
Cultural Heritage Conservation and Rehabilitation								
Rehabilitation of the Administrative Complex building	Improvement of Quality of Life	Improvement in the working environment for the employees and of the general image of Mawlamyine administration for the population	-	-	-	Maximize advertisement of the rehabilitation program and result at local and national level to promote similar initiative in other cities	-	-
		Creates a model for the promotion of cultural heritage conservation and rehabilitation by their owners	-	-	-	Ensure financial incentive procedure is officialised rapidly and advertise around it in Mawlamyine through promotion campaign and supporting material (leaflets, posters and dedicated desk for detailed information in the Administrative building)	-	-
			-	-	-	Include rehabilitated buildings into visits of tours operators	-	-

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

6 PROJECT ALTERNATIVES

For water supply, the “No Project” alternative shall maintain the urban population in a situation of the delivery of insufficient and unsafe domestic water. A significant number of wards shall continue to rely on underground water resources, more and more polluted and contaminated by the septic tanks servicing an increasing population, and oblige the population to rely on expensive water bottles for drinking purposes.

For the solid waste component, should no action being implemented and the present 2016 situation for MSW management being maintained on the long term, the cleanliness of the city shall continue to decrease with more solid waste dumped in the urban area creating unhealthy conditions and increasing the clogging of the drainage network, resulting in more frequent conditions of localised flooding during the wet season, with secondary impacts on the city activities and economy.

Furthermore, the “No Project” alternative should have much more detrimental impacts on GHG emissions as presented in **Table 6-1**.

Table 6-1: Comparison of GHG Emissions with and without Project

SITUATION	YEAR	COLLECTED WASTE				UNCOLLECTED	TOTAL
		COLLECTION	RECYCLING	COMPOSTING	LANDFILLING		
MAWLAMYINE							
No Project	2020	48	-12 208	0	19 983	13 178	21 001
	2040	131	-26 374	0	43 172	28 469	45 397
With Project	2020	98	-20 347	-8 821	4 731	2 762	-21 577
	2040	157	-43 957	-51 791	7 473	1 242	-86 875
Difference	2020	50	-8 139	-8 821	-15 252	-10 416	-42 578
	2040	27	-17 583	-51 791	-35 698	-27 226	-132 272

Source: PPTA Consultant, 2015

The results of the comparison shows that GHG emissions from solid waste in Mawlamyine could be **reduced by more than 42,000 t CO₂-eq/year in 2020 and even reach 132,000 t CO₂-eq/year in 2040**.

The MSW management measures proposed under the Project should result, from 2016 to 2040, in the cumulated emission avoidance of almost 2,13 Million t CO₂-eq. Composting is by far the most beneficial activity in terms of GHG avoidance, should the target of 90% of the compost produced to be used as fertilizer substitute for agriculture or urban greening, be effective. This objective is considered achievable as the plant operation may involve private sector (DBO type) and considering the extensive areas of industrial plantations (fruit trees, rubber) and rice fields in the Mon State which rely on fertilizer for their production.

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

For the cultural heritage component, no action will simply let the Mawlamyine cultural heritage to continue degradation and progressively reduce the city attraction for tourists, with consequent decrease of income from tourism sector.

7 INFORMATION DISCLOSURE AND PUBLIC CONSULTATION

7.1 Consultation and Public Participation Process

Information disclosure and stakeholder consultations were conducted as part of the environmental assessment process. The consultations involved in-depth key informant interviews with relevant Government agencies and focus grouped discussions.

The consultations aimed on environmental issues and concerns affecting the community. Specifically, the objectives of the consultation meetings are the following:

- To present the proposed projects to the stakeholders;
- To solicit views of the stakeholders relative to the proposed project;
- To identify the most important project components for the locals;
- To identify possible environmental issues inherent on the proposed project and to identify mitigation measures to address these issues in the project design.

Preliminary consultations with relevant Government agencies were conducted as part of the IEE of the proposed project. The focus grouped consultations primarily focused on presenting the project components, identifying the most important issue for the locals, receiving inputs and suggestions from the participants regarding environmental concerns arising out of the project, obtain baseline environmental and cultural information for project sites as well as Government clearance requirements and discuss their opinions on the perceived environmental impacts of the project. Suggestions were sought on measures to consider to properly implementing the project and in avoiding any potential adverse impact.

The principles of information dissemination, information solicitation, integration, coordination, and engagement into dialogue were incorporated during the preliminary consultations.

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

7.2 Consultation Meetings

7.2.1 SCHEDULE AND PARTICIPATION

Main consultation activities held during the PPTA are summarized in **Table 7-1**.

Table 7-1: Consultation Activities for Environment Component

DATE	ACTIVITY	PERSONS MET	LOCATION	PURPOSE
Throughout the project since 27 April 2015	Meetings and interviews	Department heads of township and state Development Affairs	MTDC office	To get better understanding of the project and the existing situations, and the requirements for the projects; to obtain perspectives and suggestions from the MCDC officers and representatives on the project
30 April 2015	In-depth key informant interviews	Deputy Director, Staff Officer	Environmental Conservation Department, Mon State, Ministry of Environmental Conservation and Forestry.	To discuss about the Environmental Impact Assessment Procedures (Draft) and implication of the draft EIA procedures on the proposed project, to obtain views and concerns on the current environmental issues and to discuss initial scoping of the project and scope of the IEE/EIA assignment, to reveal the roles of the residence office of Environmental Conservation Department, Mon State.
30 April 2015	In-depth key informant interviews	Deputy Director	Forest Department, Mawlamyine District, Ministry of Environmental Conservation and Forestry.	To gather the common plant and tree species found in the region, and to discuss the concerns and suggestions regarding the existing environmental situation
20 July 2015	In-depth key informant interviews	Director and Staff officers	Meteorological Department, Mon State	To inquiry to buy the meteorological data, the availability, and discuss on the current issues of environmental and climate change,
22 July 2015	In-depth key informant	Professor	Marine Science Department,	To inquiry the local fish species, environmental status, concerns and

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

DATE	ACTIVITY	PERSONS MET	LOCATION	PURPOSE
	interviews		University of Mawlamyine	suggestions, the existing water quality data of Thanlwin and Attran river, and to discuss on the mangroves in the region
23 July 2015	Observation of the State level workshop	Representatives of General Administrative Offices, Members of TDC	Mon State Hluttaw	To observe the discussions on the main issues raised and requirements regarding each township developments in Mon State.
28-29 September 2015	Public consultation with the locals, stakeholders and civil society	Project Manager (National Enlightenment Institute); Ward Administrators (Auk Kyin, Thar Yar Aye Ward), Director (Mon Women's Organization); Regional Manager (Local Resource Manager)		To disclose the proposed project and gather information on the critical environmental problem in the society, and the concerns and suggestions on the proposed project.

7.2.2 SUMMARY OF FEEDBACKS FROM PARTICIPANTS

From discussing with the public and the stakeholders, it was summarized that the necessity of good quality water supply, and the good solid waste management are important for Mawlamyine. Some main feedbacks from the discussions are as follow:

- In order to implement the good management on the municipality such as solid waste and water supply, there should also be strict rules and regulations.
- The civil society thinks having own tube wells at every household may effect on the destruction of the underground water table in the future.
- Public awareness and individual awareness are very crucial to keep the environment clean. More training programs on raising public awareness should be encouraged.
- To bring up the successful project and to avoid unwanted negative impacts on natural and social Environment, proper management along the whole project cycle is very crucial.

7.3 Future Consultations

Information dissemination to, consultation with and participation of affected people and involved agencies reduce the potential for conflicts and minimize the risk of project delays. Further information and consultations will be carried out before

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

construction starts (during the first year of the project) and during the construction period.

Prior to the start of the construction, consultation will be carried out in all the areas where the proposed project activities area anticipated. The objective will be to provide the local population with accurate information on activities to be undertaken, on the schedule of these activities and on the potential nuisances for them during construction. This information stage, which concerns all the project sites, will be carried out jointly with the team in charge of RP preparation in those areas concerned by compensation and/or resettlement.

During construction stage, consultation will be carried out with local population in specific area where construction activities are expected to start within 1 month. This will be carried out through focus group discussion with residents and key stakeholders (police station, ward heads) on possible nuisances (noise, dust, traffic/access constraint, temporary suspension of public utility, etc.), on safety measures they will have to respect (regarding engines under activity, risks of fall in excavations, risks specific to children etc.) and on the detailed schedule of activities.

At the end of the construction activities in a dedicated site, inspection of site to ensure cleaning and rehabilitation has been done by the Contractor will include interview of residents to possibly identify non-compliance in the rehabilitation of the site.

7.4 Disclosure

The Draft Final IEE will be submitted to the ADB for review and approval. It will then be transferred to the Mon State Development Affairs for endorsement. Upon finalization, the final IEE will be disclosed on the ADB's website before the Board Approval, in compliance with ADB Public Communication Policy (2011).

The IEE will be used by the Mon State Development Affairs to produce the EIA report in Myanmar language. The report will be submitted to MONREC for environmental clearance⁶. The EIA report will be made available for consultation by the public in the Mon State Development Affairs-PMO premises. The summary of the EIA in Myanmar language will be made available at dedicated locations in the concerned areas as police station, ward heads.

⁶ First stage in the process has been achieved in April 2017 with the submission by the Mon State Government to MONREC-ECD of the Project Proposal. EIA report are already under preparation and expected to be ready for submission not later than mid 2017.

8 GRIEVANCE AND REDRESS MECHANISM

A grievance redress mechanism (GRM) will be established in compliance with ADB's SPS (2009) requirement to prevent and address community concerns and assist the project to maximize environmental and social benefits. The grievance mechanism proposed for the environmental issues follows the same process than the one proposed for the compensation and resettlement issues.

The GRM will be accessible to diverse members of the community, including more vulnerable groups such as women and youth. Multiple points of entry, including face-to-face meetings, written complaints, telephone conversations, or e-mail, will be available. Opportunities for confidentiality and privacy for complainants will be honoured where this is seen as important.

8.1 Types of Grievance Expected and Eligibility Assessment

Public grievances addressed by the GRM will most likely relate to environmental issues during the construction phase, as consultations with potentially affected people conducted during project preparation confirmed their basic support to the project. Grievances will most likely include damage to public roads due to heavy vehicle operation and transportation of heavy equipment and materials; disturbance of traffic and increased traffic congestion; dust emissions; construction noise; inappropriate disposal of waste materials; damage to private houses; safety measures for the protection of the general public and construction workers; water quality deterioration, disruption of services (water supply, electricity), loss of access, etc.

During operation, grievances will most likely include nuisances related to unpleasant odours around waste collection points or around the landfill site. Possible grievances may also concern quality of distributed water during maintenance works on the network or pressure problems in some areas.

8.2 Proposed Mechanism

The overall purpose of the grievance redress mechanism (GRM) will be to reduce risk for the project, offer communities an effective platform for expressing concerns, and achieving solutions that will promote a constructive relationship between the government, project staff, and communities.

Specifically, the project GRM will be established to allow all persons affected by the urban infrastructure and services project to appeal any disagreeable decision, practice, or activity arising from the implementation of the Third Greater Mekong Subregion Corridor Town Development Project.

The design of the GRM should enable the mechanism to provide:

- a predictable, transparent, and credible process to all parties, resulting in outcomes that are seen as fair, effective, and lasting;
- builds trust as an integral component of broader community relations activities; and
- enables more systematic identification of issues or problems, facilitating corrective action, and pre-emptive engagement.

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

The GRM will include the following elements:

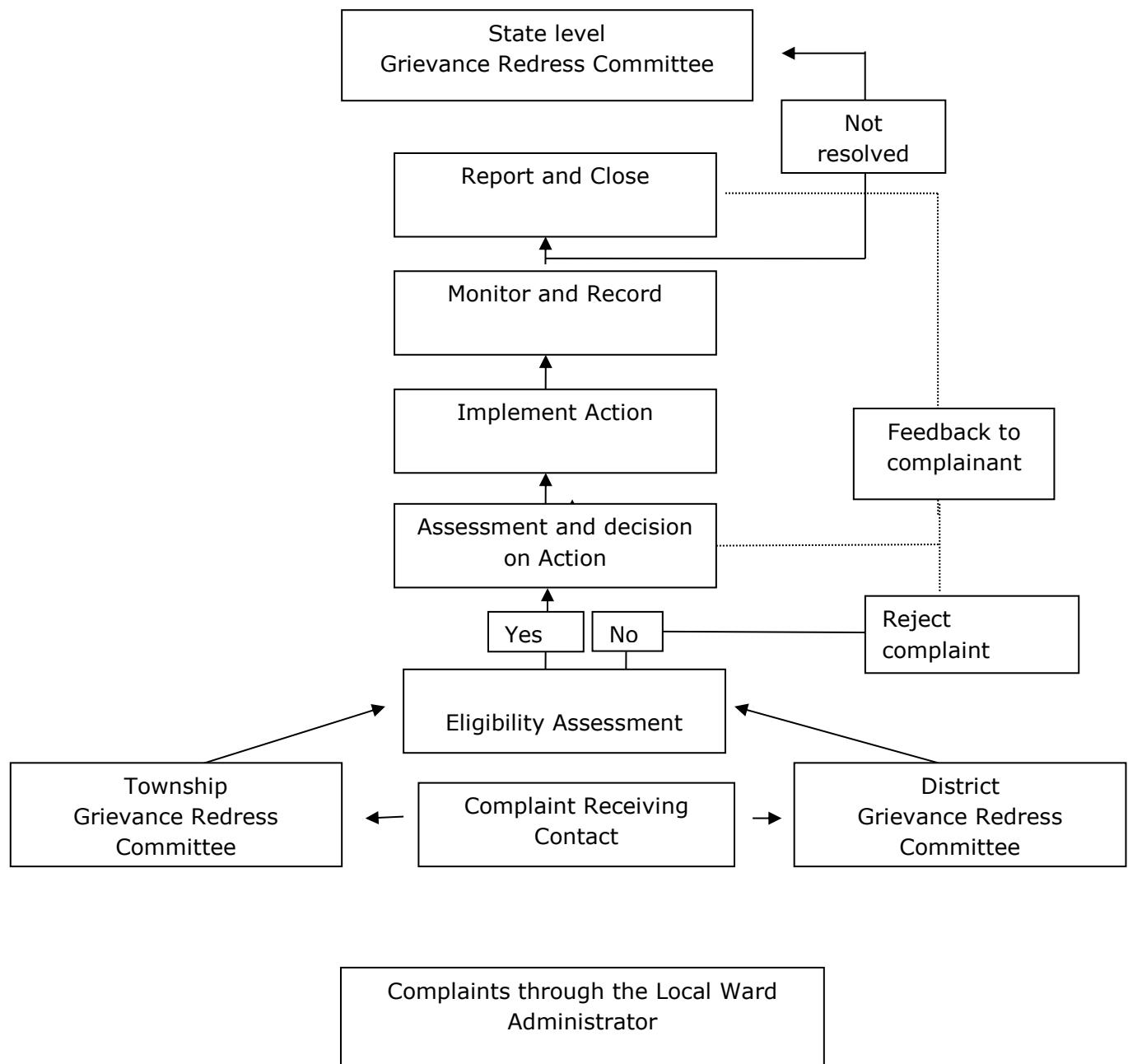
- a transparent grievance receipt and registration system to provide ways for community members to register complaints and confirm they have been received;
- grievance eligibility assessment to determine if the issues raised in the complaint fall within the mandate of the grievance mechanism and if the complainants are legitimate;
- grievance assessment and investigation to clarify concerns raised in the complaint, to gather information on the situation, and to identify how the issues might be resolved;
- several choices for solving problems are as follows:
 1. Internal decision-making processes, whereby issues are handled by designated members of the GRM, using set criteria to develop a response to the grievance and to allow for tracking complaints, monitoring and evaluation of the resolution and an appeals process.
 2. Joint problem-solving, in which the project and the complainant engage in a dialogue and action planning to resolve the problem.
 3. Third-party mediation to facilitate a solution when a voluntary agreement is not possible.
- grievance tracking, including maintenance of written records of grievances, monitoring, public information disclosure and reporting to the community; and
- grievance closure, including community feedback and confirmation of resolution of the problem.

All project stakeholders (Ministry of Construction [MOC], Project Management Office [PMO] and Project Implementation Unit [PIU] staff of the Kayin and Mon State Governments [M/KSG], district/township/ward officials, communities, civil society organizations (CSOs), and ADB staff) were involved in the design of the GRM—to outline the purpose, structure, and specifics about how the grievance mechanism will function.

Below is the structure of the GRM and its operational arrangements.

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development



The GRM will be established in three townships, namely Mawlamyine, Hpa-An and Myawaddy. It involves the following process:

- Stage 1: Access to the GRM. If a concern arises, the complainant will make his/her complaint known to the Local Ward Administrator (LWA) of the concerned ward through verbal, phone, email, or written submission. CSOs may file complaints on behalf of affected persons through the LWA or directly to the Complaint Receiving Contact (CRC) with a copy to the LWA.
- Stage 2: Submission and Registration. The LWA or CSO will submit a written complaint to the Complaint Receiving Contact (CRC). The CRC will register the

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

complaint and forward it to the township grievance redress committee (GRC) or district GRC depending on the nature of the complaint. The CRC will issue an acknowledgement of receipt of the complaint with information of which GRC will handle the complaint to the LWA. The LWA will inform the complainant and CSO if appropriate, and deliver the acknowledgement of receipt. The township level GRC will handle complaints or queries pertaining to construction activities (including road safety, and environmental issues), information about project activities, give general feedback. The district level GRC will handle complaints regarding environment and construction-related impacts, resettlement, compensation and livelihood improvement issues.

- Stage 3: Determine Eligibility. The township or district GRC will determine whether the complaint requires further action to address. A screening procedure based on simple eligibility criteria will be established for the GRCs. If the complaint is deemed ineligible, the complainant is informed of the decision and the reasons for ineligibility. Where appropriate, the GRC may refer the complainant to alternative options for resolution of the complaint.
- Stage 4: Assessment and Decision on Action. If the complaint is eligible, the appropriate GRC will conduct an assessment and gather information about the complaint and key issues and concerns to determine how the complaint might be resolved. The LWA and community members will participate in the assessment as necessary. If outside experts or technical information is needed, the GRC may seek such guidance and may request all parties concerned to participate in the GRM process. The GRM may offer a variety of grievance resolution approaches. The decision on the solution will be by the GRC. The GRC will develop an action plan and identifies responsibilities for the plan. This action plan will be reported to the complainant through the LWA.
- Stage 5: Implementation of Actions. Implementation of the action plan commences with close collaboration of relevant project stakeholders depending on the type of complaint.
- Stage 6: Monitoring and Reporting on Implementation. The GRC will monitor the implementation of actions and record findings which will be filed through the CRC. As part of the monitoring process, the GRC will consult the relevant project stakeholders, as needed. The monitoring time frame will be project-specific depending on the implementation of the actions.
- Stage 7: Closure of the Complaint. When the monitoring has been completed, the GRC will prepare a final report which is shared with the LWA and complainant, and filed with the CRC. The complainant will confirm completion of the actions and agree to the closure of the complaint. The grievance dossier is closed and filed in the project archive.
- Stage 8: Appeal to the State GRC. If the complainant is not satisfied with the solution suggested by the GRC during the assessment stage or after the implementation of actions, an appeal can be lodged at the state GRC through the LWA in writing, with a copy sent to the PMO/PIU of the M/KSG. The state GRC will serve as the second level authority for addressing grievances that were not resolved satisfactorily. It will also look into grievances regarding inconsistencies of grievance handling by the township and district GRCs. It may assign a second investigation of the grievance case to another expert or group of experts, depending on the required expertise for analysis and reporting, with final decision-making remaining with the State GRC.

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

If efforts to resolve complaints or disputes are still unresolved and unsatisfactory, the complainants have the right to send their concerns or problems directly to ADB's Southeast Asia Department (SERD) through ADB Myanmar Resident Mission. If the households are still not satisfied with the responses of SERD, they can directly contact the ADB's Office of the Special Project Facilitator as outlined in the Information Guide to the Consultation Phase of the ADB Accountability Mechanism.

GRM proceedings will entail one or more meetings for each complaint and may require field investigations by specific technical or valuation experts. Grievance cases shared by more than one complainant will be treated as a single case.

The GRC and the procedures for resolving complaints and grievances will be made public through an effective public information campaign. During the RP updating process when the detailed engineering design is available, the grievance redress procedure shall also be explained in the project's Public Information Booklet.

The mechanism proposed relies on the creation of a Grievance Redress Committee (GRC) integrated into the Department of Public Relations and Information (DPRI) of MSG and basically dealing with grievances related to resettlement and compensation. The GRC will additionally address those complaints related to construction activities when the grievance cannot be closed at the level of the contractor. The GRC, as defined in the RAP, will be headed by the Senior Officer of DPRI and would include representatives from townships, from civil society (Woman Association, Elder groups, Social Welfare groups) and Community representatives from the complainant's ward.

When construction starts, a sign will be erected at each construction site providing the public with updated project information and summarizing the grievance redress mechanism process including details of the GRM entry points. The contact persons for different GRM entry points, such as PMO, community leaders, contractors, and operators of project facilities, will be identified prior to construction. The contact details for the entry points (e.g. phone numbers, addresses, e-mail addresses, etc.) will be publicly disseminated on information boards at construction sites and on the website of the local government.

The GRC will establish a GRM tracking and documentation system. The system will include the following elements: (i) tracking forms and procedures for gathering information from project personnel and complainant(s); (ii) dedicated staff to update the database routinely; (iii) systems with the capacity to analyse information so as to recognize grievance patterns, identify any systemic causes of grievances, promote transparency, publicize how complaints are being handled, and periodically evaluate the overall functioning of the mechanism; (iv) processes for informing stakeholders about the status of a case; and (v) procedures to retrieve data for reporting purposes, including the periodic reports to the ADB.

9 ENVIRONMENTAL MANAGEMENT PLAN

9.1 Purpose and Objectives

The role of the Environmental Assessment process is to identify the impacts which may be caused by the project and to develop a series of attenuating or mitigating measures which will be technically appropriate, financially acceptable and easily applicable in the context of the project. These measures are identified in Chapter 6 of the present IEE.

The role of the EMP is to complement this analysis by defining the operational context in which these measures will be implemented. The present chapter therefore sets out the principles, the approach, the procedures and methods which will be applied to monitor and reduce the environmental and social impacts resulting from the construction works and subsequent operation of the components projected in Mawlamyine.

To this effect, the EMP includes 3 complementary Action Programs that are adapted to the phases of pre-construction, construction and operation of the Project components:

- The Preliminary Program of Action (PPA), which includes all the measures recommended during the early stage of the Project, particularly before the construction works start. These measures essentially concern the organization and training of the teams which will be responsible for environmental and social management during construction and operation of the project, as well as all the complementary studies and investigations identified during preparation of the EIA and deemed to be necessary before starting the construction works.
- The Program of Actions adapted to the Construction period (PAC), which defines the principles of organization and the environmental inspection procedures for the construction sites. This PAC also defines the contractors' obligations in relation to environmental and social management of the construction sites and camps.
- The Program of Actions adapted to the Operation period (PAO), which defines the environmental quality controls (water, air and noise) applicable during the period of operation of the structures and necessary to evaluate the environmental efficiency and performance of the corrective measures put in place.

The present EMP accordingly establishes and describes the context in which all the proposed corrective measures shall be implemented, under the following headings:

- organization to be established to ensure effective implementation of the corrective measures and the associated environmental monitoring;
- role and responsibilities of the various parties to be involved in the Project;
- principal tasks to be undertaken during the phases of preparation, construction and operation of the project;
- complementary studies deemed to be necessary;
- financial resources to be mobilized and their origin.

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

All the measures proposed in this EMP are based on the results of the analysis of impacts and corrective measures outlined in previous Section 5 of the present EIA. These aspects will not therefore be repeated here.

9.2 Summary of Key Impacts

As detailed in Chapter 6 of the report, anticipated key detrimental impacts from the project components are summarized in **Table 9-1**.

Table 9-1: Summary of Project Key Impacts

GMS 3 COMPONENTS	ANTICIPATED KEY IMPACT
Improved Water Supply Systems	
Creation of WTP	No land acquisition; No detrimental impact anticipated Occupational health and safety risks during construction and operation stages; Water contamination risk during operation is limited;
Creation of 4,000 m ³ storage	No land acquisition; No detrimental impact anticipated
Rehabilitation of existing 3 storages	No land acquisition; No detrimental impact anticipated Work completed in 2016 under JICA WS Project, only minor improvements on the piping remain under GMS.
WS Network Rehabilitation and extension	No land acquisition; Mainly risk of nuisances during construction activities; occupational and public safety mainly related to road traffic next to worksites in public streets, risk of water contamination during network rehabilitation.
Improved Solid Waste Management	
Creation of 56 collection points	Mainly risk of temporary nuisances from construction activities; few trees to be cut in some sites; odours nuisance during operation if not regularly cleaned
Construction of a sanitary landfill	1.5 hectare of land acquisition; deviation of the stream shall be well designed and implemented Risk of contamination of water bodies by leachate but leachate collection and treatment is already included in the landfill design.
Construction of a composting plant	No land acquisition; No detrimental impact anticipated
Conservation of Cultural Heritage	
Rehabilitation Administrative Complex Building	No land acquisition; Limited nuisances from construction activities;

As observed from this table, only limited environmental impacts are anticipated from the Project components. All new components are developed on land own by TDC or MSG (except 1.5 ha acquired for the landfill), so avoiding delicate process for land acquisition and compensation. Only limited nuisances are anticipated from the construction activities, particularly those which are located within urbanized areas. No forest clearing is required. As a Resettlement Plan (RP) is prepared in parallel with this IEE, where social issues are addressed, this EMP principally focuses on construction activities, supervision and monitoring activities during construction period and operation.

9.3 EMP Organisation and Responsibilities

9.3.1 OVERALL ORGANIZATION

Three levels of organization for environmental management, fully complementary, will be set-up:

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

- The Government Implementing Agency (IA) through its PMO and the PIU, will have to provide for all aspects related to environment and social including (i) general supervision of activities carried out prior, during and after construction of the project and (ii) coordination with other stakeholders including other Government Agencies and IFIs involved (ADB any other lending institution);
- The Project Implementation Support Consultant (PISC) will assist PMO and the PIU for all aspects dealing with environmental management preparation, provide environmental training to PMO and PIU staff, provide coordination and supervision for all environment-related activities during construction and report regularly to the IA;
- The Construction Contractor Environment, Health and Safety Unit (CC-EHSU), will provide resources for, and effective implementation of, all measures which are defined in the EMP and in the contract documentation in addition to health and safety aspects on site.

Environmental staff in the PMO, PISC and CC is intended to be independent of construction staff. Environmental staff will work alongside construction staff, however they will report through separate channels up to the Project Director for the PIC and to the executive management level for each CC concerned.

9.3.2 STAKEHOLDER ORGANISATION

The IA-PMO will have an integrating role at the top of the organisation. It will be responsible for (i) informing the political and financial agencies of the correct implementation of the EMP and (ii) ensuring effective compliance in terms of E&S obligations and procedures in the implementation of the Project. To do this, it will appoint a Director Environmental and Social (DES), whose role shall be (i) to supervise the Project's environmental and social activities in the name of the IA and (ii) to ensure coordination with the international agencies (funding agencies, investors, panel of experts) and national agencies (other Government Ministries, NGOs). The PMO-DES will in particular follow up and ensure operations relating to compensation and resettlement of APs resulting from the implementation of the project components are progressing satisfactorily. The DES will be assisted in this supervisory role by the PIC.

The PIC will set up within its Engineering Team an Environmental Management Unit (EMU) which will ensure effective implementation of the environmental measures. This team will be under the responsibility of a Manager Environment, Health and Safety (PIC-MEHS) assisted by staff responsible for supervising EHS aspects on the construction sites, grievances expressed by the population, any disturbances or harmful impacts they are subjected to, claims for compensation for temporary disorders related to the construction activities and liaison with the traditional local authorities or representatives of the State. The EMU will include a team of Site Inspectors.

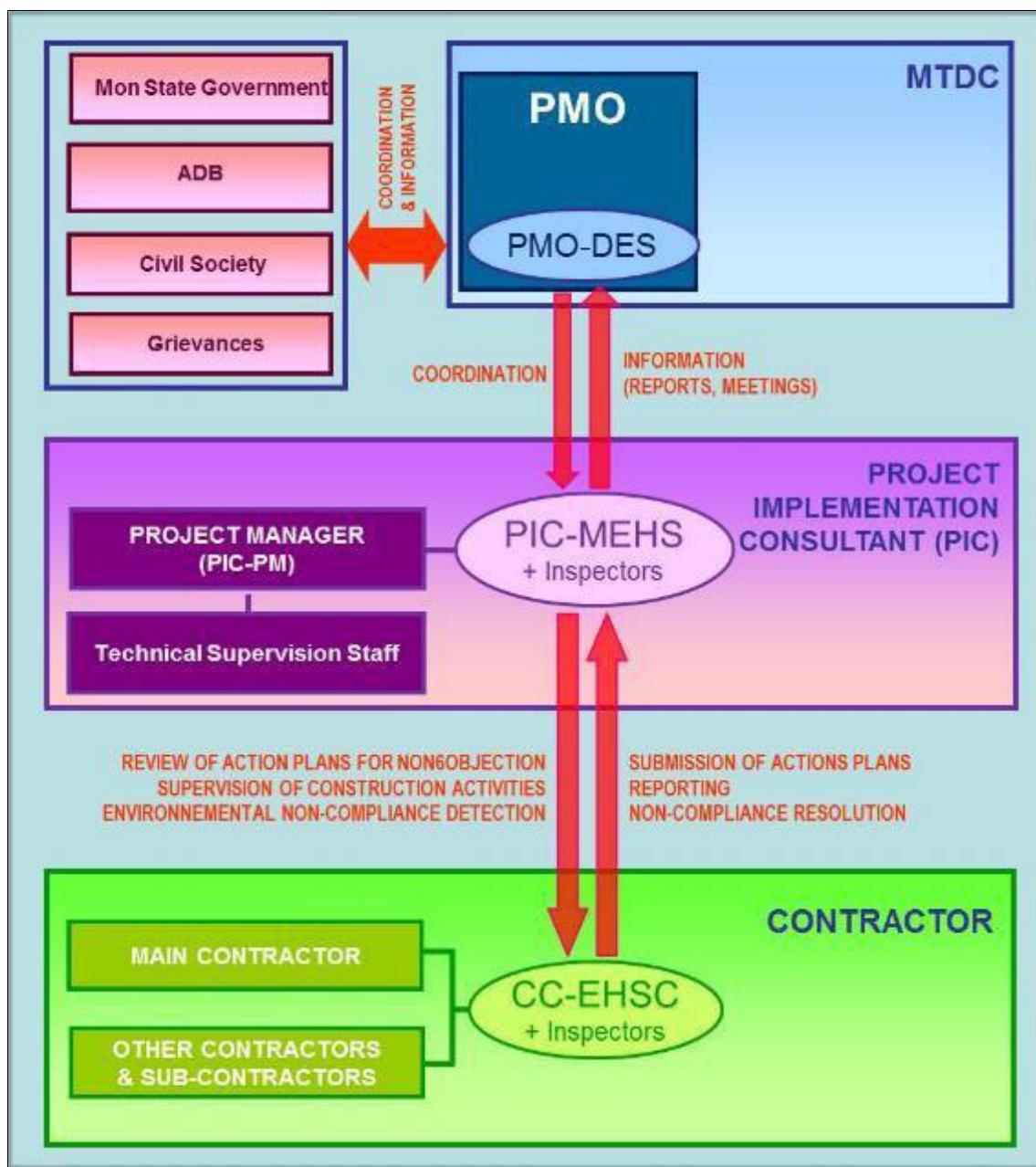
Each CC having responsibility for one of the main components will set up its own EHS Unit (EHSU) responsible for providing the interface with its construction team. Depending on how the contracts are distributed, certain contractors may group together to set up a common environmental team. Each EHSU will have an EHS Coordinator (EHSC) and Environment, Health & Safety (EHS) Inspectors.

Proposed organization is depicted on **Figure 9-1**.

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

Figure 9-1: Proposed Organization for EMP Implementation



9.3.3 STAKEHOLDERS ROLES AND RESPONSIBILITIES

ROLE OF PMO-DES

Project Preparation Phase

- Coordinate, with those concerned, the definition of the environmental measures at the level of detailed design and prepare the corresponding environmental obligations of the contractors as General and Particular Specifications in the Tender Documents;

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

- participate in the evaluation of the tenders and negotiation with the contractors for all the environmental and social aspects;
- ensure coordination with the financial institutions involved (ADB), in order to guarantee compliance with their specific environmental and social requirements;
- ensure, with those concerned, the monitoring and coordination of all consultations carried out with the local population prior to starting the construction works; this aspect is particularly important for urban development components;
- coordinate with Government Authorities concerned, the issues of land acquisition and compensation operations required to be completed before the start of construction works;
- prepare timeline for compliance with various national applicable laws and requirements including environmental emission standards.

Construction Phase

- Ensure coordination of activities with the PIC-EMU;
- participate in environmental coordination meetings with the representatives concerned from PIC and Contractors;
- directly refer results and problems encountered to the PMO-Project Director;
- contribute for E&S aspects to the monthly and/or quarterly Works Progress Reports prepared to the attention of the IA, of the EA and of the lenders (ADB);
- provide liaison with MONREC;
- provide liaison with other authorities as required.

Operating Phase

At the end of the Project construction, the various components will come under the responsibility of various MTDC Departments. Each department will need to be clearly informed about the environmental monitoring requirements and to have organized in accordance. The PMO-DES will:

- Ensure coordination between MTDC Departments on environmental issues and monitoring needs;
- ensure environmental monitoring required on the sites are efficiently implemented;
- ensure effective completion of the measures to rehabilitate the sites temporarily used during construction;

Role of Project Implementation Consultant (PIC)

- At the start of the Project Contract, the PIC Manager EHS (PIC-MEHS) will provide training to PMO-DES and other staff of PMO and PIU regarding results of EIA reports, EMP obligations, organization of PMO for environmental management;
- Preparation of baseline template documentation required for PMO-DES activities: weekly, monthly report structure, template checklists for site inspection, etc.
- Assistance for ToR and contract preparation for effect monitoring (air, water) to be carried out by any registered laboratory appointed by PMO;

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

- Organize and control the work performed by the Environmental Management Unit (PIC-EMU);
- ensure coordination with the PMO-DES;
- ensure that all environmental plans and programs requested from the CCs (this generic term covering all the main Construction Contractors) have been submitted and have been non-objected prior to the start of works;
- with PIC-EMU inspector collaboration, check whether the Contractor's environmental obligations have effectively been complied with on the sites, and refer to his manager (the PIC-Project Manager, PIC-PM) any detected case of non-conformity for formal action;
- report any observed case of non-conformity and ensure that it is remedied by the concerned CC within the imposed time limit;
- participate in the site monitoring meetings and prepare a monthly environmental monitoring report covering all project components;
- prepare the monthly evaluation report, recording the Contractor's environmental performance, which may, if necessary, be used to justify a deduction on the monthly claim for payment presented to the PMO;
- ensure the regular implementation of compliance monitoring programs (water and air quality) and present the interpretation of results in the context of the monthly report;
- provide liaison with the local communities concerned for any social aspect including health, respect of recruitment procedures, land use agreements, handling of complaints and compensation for unexpected damages to private property during construction activities;
- organize a database for storing all environmental documentation generated during construction of the project (letters, memos and technical notes, registers, site photos, non-compliances and resolution forms, etc.);
- prepare the documentation required prior to the project's environmental and social audits performed by the Lenders.

Role of PIC-EMU Site Inspectors

- Perform regular visits to the construction sites and the worker camps; frequency shall be adjusted according to the environmental risks, the sensitivity of the environment and the contractors' performance;
- establish reports on all detected cases of non-compliance and follow up their resolution by the concerned CC;
- regularly provide input to the environmental database, in particular the reports on non-compliance, the records of non-compliance correction and the supporting photographic documents.

Role of the Construction Contractor EHS Coordinator

The EHSC, with the support of his team, will have the following responsibilities:

- adapting construction activities to ensure they comply with the EHS obligations defined in the Tender Documents and the Terms of the Contract;
- ensuring that all sub-contractors under his responsibility comply with the same EHS obligations;

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

- preparing the environmental plans and programs specified by the Tender Documents, in particular the monitoring programs;
- supervising the environmental good practices for construction activities on all construction sites used by the Contractor or his sub-contractors, by calling on his inspectors to make regular inspection visits;
- treating cases of non-compliance notified by these inspectors and instructing the construction teams to apply the necessary remedial measures immediately;
- preparing the weekly and monthly activity reports for presentation to the PIC-MEHS;
- organizing and performing E&S training of CC staff (management & workers).

9.4 Key Environmental Management procedures

9.4.1 INTERNAL COMMUNICATION PROCEDURES

The efficiency of environmental and social management is dependent upon the clear organisation of communication among the stakeholders as shown in **Table 9-2**. In particular, there has to be a clearly defined channel for handling rapidly all possible environmental disorders and implementing efficiently the necessary remedial actions, especially in emergency situations.

The following table presents the key links with regard to internal communication among the stakeholders during the construction period. This procedure must be laid down in greater detail before the start of the project in accordance with the Contractor EHS policy and the final Project organisation.

Table 9-2: Main Steps of Internal Communication

ORIGIN	RECIPIENT	FREQUENCY	SUBJECT
PIC-PM	PIC-MEHS	Weekly	Updating the construction programme; specific construction activities in the coming period and their location
PIC-PM	PMO-DES, PIC-MEHS	Ad hoc	Additional needs for land, or notification of a change in construction techniques
PIC-MEHS	PIC-PM	Weekly	Weekly report on environmental events (EE) detected and their treatment; programme of activity of the PIC-EMU for the coming week
PIC-MEHS	PIC-PM	Ad hoc	Communication of EE of levels II or III
PIC-MEHS	PIC-PM	Monthly	Monthly report on activity and results of monitoring for review and approval before forwarding to the PMO-DES
PIC-MEHS	PIC-Inspectors	Weekly	Updating the construction programme; specific construction activities in the coming period and their location, particular directives
PIC-Inspectors	PIC-MEHS	Weekly	Weekly activity report, list of observed EE of level I
PIC-Inspectors	PIC-MES	Immediate (same day)	Observed EE of levels II & III; particular problem requiring technical assistance; observation of construction activities outside specified areas
CC-EHSC	PIC-MEHS	Monthly	List of training modules followed in the past month and the personnel concerned (list of attendance)
CC-EHSC	PIC-MEHS	Fortnightly	Updating of new activity zones for the coming 2 weeks and operations presenting a particular risk for the environment; results of monitoring of the previous 2 weeks

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

ORIGIN	RECIPIENT	FREQUENCY	SUBJECT
PIC-PM	PMO-DES	Immediate (same day)	Memo to inform on any observed non-compliance of level III; proposal to suspend the works on the incriminated site if justified
PIC-PM	PMO-DES	Monthly	Transmission of the monthly activity report including environment as prepared by the PIC-MES
PIC-MEHS	PIC-PM	Quarterly	Summary report on significant environmental events (Levels II and III) observed, on the decisions taken, and on the measures implemented; proposal, if necessary, to modify certain mandatory thresholds or obligations of the Contractor
PIC-PM	PMU-DES	Quarterly	Summary report on significant environmental events (Levels II & III) observed, on the decisions taken, and on the measures implemented; request for approval of the proposed modifications
PIC-MEHS	PMU-DES	Yearly	Annual audit of construction sites and submission of an annual environmental audit report

Note: PMO-DES (Director Environment & Social from MSG PMO) – PIC-MEHS (Manager Environment, Health& Safety from Project Implementation Consultant) – CC-EHSC (Contractor's EHS Coordinator) - EE (Environmental Event = detected non-compliance)

9.4.2 EXTERNAL COMMUNICATION PROCEDURES

External communication for environmental and social subjects will be the prerogative of his PMO-DES, assisted by MTDC's Director of Communication. This communication will essentially concern exchanges of information with the media, with NGOs and with Government representatives at Central and Regional levels. The PIC-MEHS and the CC-EHSC will only intervene in these exchanges when expressly invited to do so by PMO.

The PMO-DES will regularly contribute for all E&S aspects to the activity report provided to ADB, to various government organisations and NGOs in Myanmar.

9.4.3 ENVIRONMENTAL EVENTS MANAGEMENT PROCEDURE

An important element of the process of communication among the parties is the ranking of events which do not meet the obligations and environmental objectives assigned to the project. These situations detected on site by the PIC-EMU must then be notified to a higher level but following procedures that are graduated according to the extent of the risk and the urgency of remedial action. These environmental events could be ranked according to the system of quality assurance applied to the construction works, in which case their subdivision would be variable according to the subdivisions taken into account for non-conformity of a technical nature. In the present EMP, considering the absence of information on the project's future quality assurance plan, preference is given to an evaluation system specific to environmental aspects, better adapted to the problems encountered and which represents a proven and reliable system, which can work satisfactorily even in the absence of an efficient quality assurance system.

Environmental events correspond to non-conformities (Non-Compliances, NC) and are subdivided into three levels. The communication and handling procedures depend on the level of non-conformity. Level III represents the most serious incidents, while level I represents the incidents of least gravity.

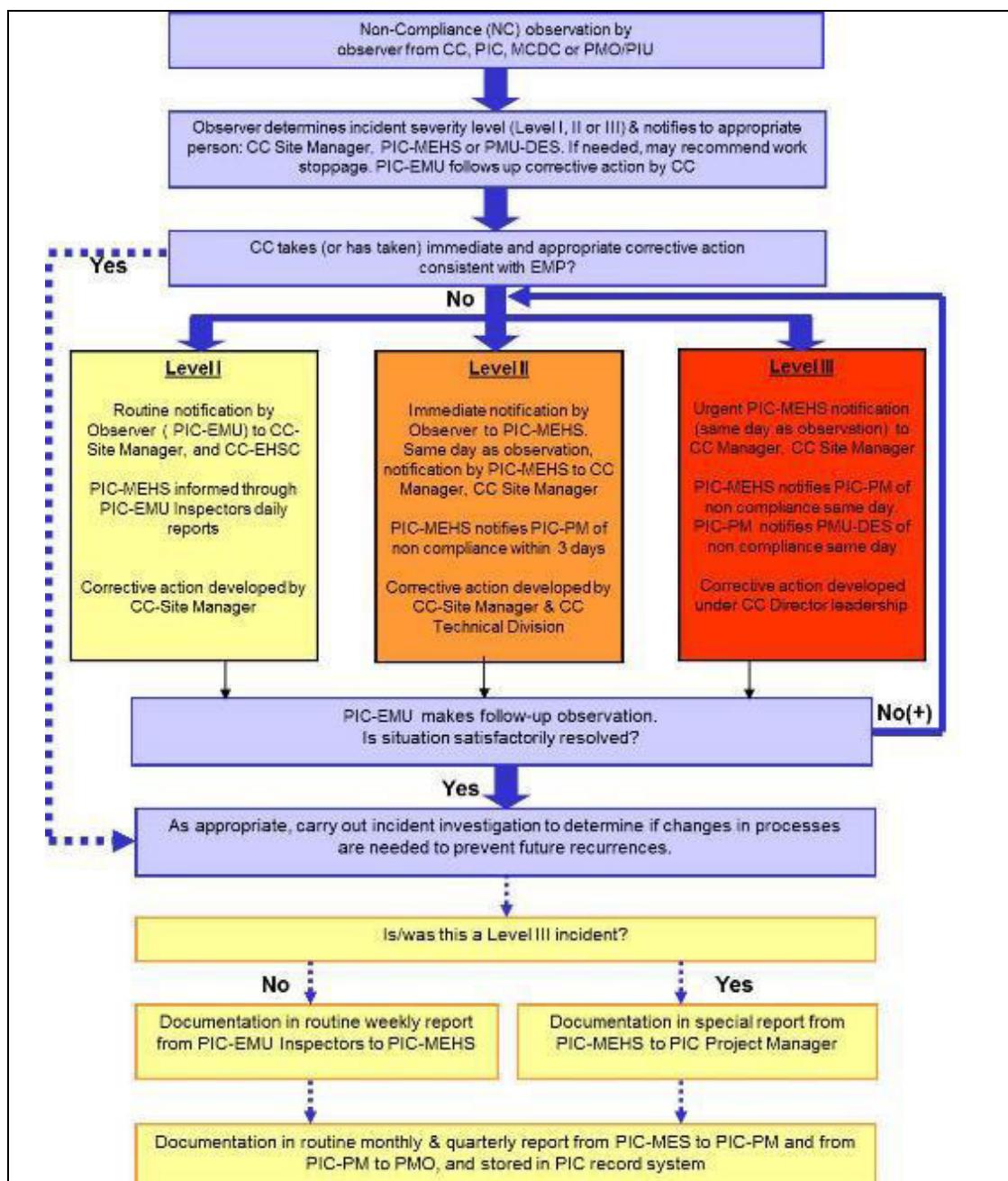
Level I (Minor Incident): Situations on Level I are addressed on a day-to-day basis at the time of site visits and routine meetings; the recommended measures

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

are generally discussed on the spot with the construction teams concerned. Formal communication takes place through the Environmental Event (EE) report prepared by the PIC-EMU Inspectors and handed to the PIC-MEHS for official notification to the concerned CC-EHSC.

Figure 9-2: Diagram of Procedure for Non-Compliance Resolution



Source: PPTA Consultant, 2015.

Note: PMO-DES: PMO Director E&S; PIC-MEHS: Project Implementation Consultant Manager EHS; CC-EHSC: Construction Contractor EHS Coordinator; PM: Project Manager (from PMO, PIC or CC); MTDC: Mawlamyine Township Development Committee

Level II (Moderate Incident): The EE of Level II is notified by the PIC-MEHS to the PIC-Project Manager and the CC Site Supervisor the same day as the situation is observed, and within three days to the PMO-DES. The PMO-DES informs the PMO

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

Project Director of the situation and details the proposed corrective measures, which must be implemented as rapidly as possible.

Level III (Major Incident): The PIC-Project Manager and the PMO-Project Director must be informed on the day an event is observed. The corrective measures must be applied within three days. Should more time be required to implement a corrective measure, or if the risk is imminent, the PIC-PM may order suspension of the works concerned until the observed situation returns to normal.

Figure 9-2 illustrates the principles of this non-compliance procedure and shows how the approach favours direct resolution on site of the less serious EE (Level I) by direct communication with the construction workers, and how the senior levels of responsibility are progressively involved in the processes to solve the more serious EE (Levels II and III). The full arrows denote the decision processes, while the dotted arrows denote the reporting and information processes.

This procedure is often implemented on complex work sites, and generally gives satisfactory results. It also offers three advantages:

- A mechanism allowing the works to be stopped if the situation is deemed to be hazardous;
- provision for feedback so that the site inspectors monitoring implementation of the requested measures can ensure that the remedial action has been taken;
- the possibility of initiating an incident enquiry in order to determine the deep-seated causes of the incident and to assess whether they justify changes in the specifications, the requirements or the methods, to prevent reoccurrence of such a situation in the future.

9.5 Action Plan Prior to Construction Works (PPA)

All the elements described above reflect the main details of the organisation to be set up for supervision and monitoring in the construction and operation phases. However, it is essential to ensure that the necessary means and references are available and totally operational from the time the works start. To this effect, a certain number of activities are to be undertaken before the start of construction works. These actions cover the aspects of recruitment, organisation and training for PMO. The main recommended actions for this pre-construction period, resulting from the impact analysis, are detailed in the following paragraphs in the form of a Preliminary Action Programme (PPA). Revision of measures proposed during this pre-construction and construction periods will be considered as soon as the PISC will be recruited. Indeed detailed design will start at this stage (for components not developed under DBO) and it is required (i) that design fully integrate mitigation measures identified in this IEE and (ii) that monitoring activities are adjusted in accordance with the selected design (particularly sampling points and parameters).

Following PPA-01 to 03 are proposed to strengthen the capacity of PMO to handle full control of environmental, health and safety issues related to project implementation.

9.5.1 PPA-01: APPOINTMENT OF THE PMO-DES

The PMO will appoint its Director Environment and Social (DES) before construction works start. The DES will be assisted at the beginning of his mandate by the Project Implementation Support Consultant (PISC) who will deliver training to the DES and

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

assist him (i) for the preparation of tenders regarding monitoring surveys, (ii) for the selection of the Consultants, (iii) for the follow-up of the studies.

9.5.2 PPA-02: ENVIRONMENTAL CAPACITY BUILDING OF PMO

The PISC-MES will carry out training of the PMO-DES and other PMO staff at the early stage of its recruitment. Purpose is to have the PMO-DES and his staff fully operational at the start of the project construction activities. Training will focus on:

- Detailed review of impact analysis and mitigation from the Third GMSIEE and national EIA for Mon State
- Detailed review of EMP Program of Action
- Organization of MSG PMO for EMP implementation
- Basics for site inspection practices: organization of visits, frequency, control checklist;
- Basics for non-compliance procedures: reporting procedure and form, organization of follow-up, procedure for resolution approval;
- Data management for PMO-DES: key information to be stored, data base organization, registers;
- Structure and content of weekly, monthly reports.

9.5.3 PPA-03: CAPACITY BUILDING ON HEALTH AND SAFETY

When observing construction sites in Mawlamyine the conclusion comes easily that health and safety considerations are still strongly ignored. Project construction sites must be compliant with international good practices regarding health and safety of workers on sites. This project may even be considered as a pilot project for introducing good EHS practices in MTDC and for the concerned contractors.

The PIC shall organise safety training courses not only for the staff of PMO but also for all technical departments of MTDC. The aim is to provide the basics of safety rules and organization of constructions sites and for the PMO staff, to clearly understand what must be required from the contractors on the sites.

Similarly and as described under the following Action Plan during construction, the Contractors will be contractually requested to organise awareness training on health and safety for all their staff.

9.5.4 PPA-04: PREPARATION OF COMMUNICATION INSTRUMENTS

In support and follow up to the public consultations carried out within this PPTA, it is important to prepare the appropriate communication material rapidly, allowing MTDC to present, before starting the works, clear information on the design of the project, on the phasing of construction work, on the recruitment procedures and on the environmental and social measures which will be implemented.

Preparation of proactive communication is essential to ensure the widest possible circulation of information at the most critical time, since it is during this period prior to the start of works, when important decisions and negotiations are in progress,

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

that information on the Project must be available in a completely transparent manner. The communication tools to be developed include:

- Colour flyers and posters to be posted all along the various sub-components sites;
- Articles in the press and radio or TV messages;
- The technical EIA documentation available for consultation by any person, at MTDC.

These documents will be prepared under the PMO-DES authority with the assistance of MTDC Communication Department and of the PIC.

9.5.5 PPA-05: PREPARATION OF CONTRACTOR EHS SPECIFICATIONS

Effective consideration of the EHS during construction activities pre-supposes the production of a clear, complete and detailed contractual document at the time the contract is awarded. This means including the specifications which will lay down all the EHS obligations to be imposed on contractors by PMO in the Tender Documents. These requirements dictated by the Project Owner will be presented in a document entitled "Environmental and Social Obligations of the Contractors", which will be prepared together with the Technical Specifications (General and Particular) of the Project. The PIC-MEHS will assist PMO for the preparation of the Tenders.

The document will set out all the EHS obligations imposed to the contractors and the principles and measures required for complying with. These obligations will be articulated around the key fields of environmental and social management for all construction activities related to the Third GMS project components, including:

- general specifications for good environmental management which will be applicable to the contractor at any point within the work site and at all times, covering areas such as: training/awareness of employees on protection of the environment and safety, management of hazardous substances and waste, protection of biodiversity, prevention of water and air pollution, preservation of soils, rehabilitation of sites;
- minimum conditions to be established in the contractors' camps and installations, covering aspects related to housing, catering, waste management, drinking water, sewerage and conditions of public hygiene;
- minimum conditions to be observed by the contractor in the field of employees' health and safety;
- minimum conditions to be observed by the contractor with a view to protecting the environment of the sites as well as that of the areas contiguous, most densely urbanized;
- minimum conditions to be observed by the contractor in managing the social aspects of construction activity including applicable procedures for temporary land occupation or in case of damage to any private property.

A specific monitoring program will be set up to ensure that the contractors fulfil their EHS obligations, detailed in the following section relating to the Construction Phase. In practice, the selected contractors will be asked to draw up a number of specific environmental plans, within a specified period of time after the contract is notified, describing how these contractors (and their sub-contractors) will be

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

organised and how they will work together to meet their environmental and social obligations. In principle, the list should cover the following key fields:

- Solid waste management plan,
- Dredging and Sediment management plan,
- Hazardous substances management plan,
- Accidental spill response plan,
- Erosion control and sedimentation management plan,
- Camps management plan,
- Workers health and safety plan,
- Air pollution, dust and noise management plan,
- Road traffic and access management plan,
- Water quality monitoring plan
- Cultural resources protection plan,
- Environmental training plan

9.6 Action Plan during Construction (PAC)

This action plan provided below is sufficiently detailed to provide the baseline information for further preparation of Contractor Environmental and Social Specifications to be included later into the Project Tender documentation. The following Program of Action will be implemented during the construction phase:

9.6.1 PAC-01: WASTE MANAGEMENT

A waste management programme will be established and will be mandatory for contractors and their sub-contractors. The programme will include two waste management plans which will be prepared and implemented by the contractors. The first relates to domestic waste (mainly generated in worker camps) and other non-hazardous waste generated on the construction sites, while the second is related to hazardous wastes. The objectives of the programme are:

- to minimize the generation of wastes by carefully considered use of raw materials;
- to sort and treat the wastes in order to limit their environmental impact;
- to raise awareness and train personnel in good waste management practices.

These plans will include procedures, in accordance with local regulations or with international best practice, concerning the handling, transport, storage, treatment and elimination of wastes depending on their category:

- Non-hazardous wastes (Group A): putrescible wastes from the camps and canteens, paper, cardboard, plastics, wood and vegetation, inert wastes from construction or demolition (concrete, scrap iron, bricks, etc.);
- Hazardous wastes (Group B): wastes that are corrosive, explosive, toxic, representing a degree of danger for humans or for the ecosystem. In the context of the present project components considered, this will mainly include engine oils and used hydraulic fluids, the residues of paints, solvents and resins,

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

first aid medical wastes, sludge from septic tanks and mobile toilets, various concrete additives (but with a lesser degree of danger for the latter).

Non-hazardous Waste Management

A system of waste segregation at source, ensuring separation of metal products (including drink cans or food cans), plastic products (bottles, cartons, wrapping, etc.), glass bottles, paper and cardboard, will be set up on the construction sites and in the camps. All these products will, as far as possible, be made available for collection by outside contractors responsible for recycling.

The workers' camp will be provided with two types of covered bins for selective collection of the various products listed above: putrescible in one, for recycling in the other. The contractor will carry out systematic awareness campaigns among residents of the camps to promote efficient use of these refuse bins.

On the construction sites, metal wastes that have not been polluted by hazardous substances (oils, acids, paints, etc.) will be collected in containers for recycling. The same applies to wood and cardboard and plastic packaging. It will be absolutely forbidden to burn plastic or lubricants.

Concrete and plaster debris that is not reused will be collected and dumped with other materials which may be usable for land filling or reclamation.

The Contractor will prepare a detailed Action Plan indicating the anticipated volumes of non-hazardous waste to be produced, the procedures for management, collection and disposal, the technical means implemented, the location and dimensions of the controlled landfill, the contact details of the companies involved in waste recycling, as well as the training programs to raise awareness among workers on this subject.

Hazardous Waste Management

Should maintenance of heavy equipment happens on site, used engine lubricants from maintenance activities or floating oily residue from oil separators will be collected in 200 litre drums with a view to recycling. The drums will be stored in a dry and covered area, surrounded by a bund the height of which will ensure retention of a volume equal to at least 110% of that of the largest container stored in the area, and equipped with an oil separation system at its outlet. The contractor will identify an acceptable solution where the waste can be burned or recycled. A register will be maintained to record all handling of used lubricants, for the purpose of monitoring wastes. Machine and plant maintenance operations will be centralised in appropriate area allowing collection of the used oils and hydraulic liquids.

Should the use of chemical substances happens on sites, the following rules shall be followed: (i) give preference to substances with low toxicity values and minimize quantities to use, (ii) used chemical substances will be stored in containers or drums in the same storage areas as used oils, as long as these substances are compatible; (iii) otherwise, they will be stored in a safe area protected from inclement weather. The possibility of reuse in situ will be evaluated; failing this, the materials will be returned to the supplier or to appropriate waste treatment installations.

9.6.2 PAC-02: HAZARDOUS SUBSTANCES MANAGEMENT

A plan for the management of chemical substances will be prepared by the Contractor, detailing the measures planned for minimising pollution risks. The

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

program will be applicable to all project activities involving the handling, storage and use of substances catalogued as hazardous. The information set out in this programme will cover the following aspects:

- procedure for registering and monitoring any substance of a hazardous nature including in particular the drafting of a safety data sheet per substance;
- procedure for identification of alternative and less hazardous substances;
- handling and storage conditions, including details on compatibility of the substances;
- emergency procedures in case of a spill;
- condition for final treatment of residues or recycling.

Chemical substances will be stored in a locked container located on a watertight floor surrounded by a bund, capable of storing at least 110% of the volume of the largest receptacle placed there. Each storage site will be provided with a substance collection pit, absorbent products and extinguishers. Standard signs will warn of the presence of toxic substances.

The substances' safety data sheets will be available on the site and from the CC-EHSC of the contractor concerned. All chemical substances stores will be regularly inspected in order to detect any possible leakage or damage to the containers.

The largest volume of chemical substances anticipated under a project of this type may concern hydrocarbons (diesel, oil and grease). The programme will lay down the conditions to be respected for storage and refuelling of machinery.

The programme will specify the pollution control equipment to be installed by contractors at the storage sites: anti-pollution kits, extinguishers, substance description sheets, etc.

At each site, the employees in charge of handling chemical substances will be given special training relative to best practice and emergency measures in case of an incident (see PAC-03 below).

9.6.3 PAC-03: ACCIDENTAL SPILL PREPAREDNESS AND RESPONSE PLAN

An anti-pollution program will be established to define the intervention procedures in case of leaks or accidental spills of liquid hazardous substances. This programme will include a description of the organisation planned for such situations and the work stations of key people. Specific training will be given for the activities to be performed in case of emergency intervention, for all staff and workers involved in any stage of the procedure. This plan will be required even if the Project doesn't imply the necessity for handling and storage of large quantities of hazardous material.

9.6.4 PAC-04: EROSION AND SEDIMENT CONTROL

Erosion control measures will be applied to all land that is stripped or excavated, all embankments and temporary or permanent deposits of materials in order to minimise and control the resulting sediment loads before they reach surface water bodies. This protection will involve, on one hand, the implementation of methods for stabilising slopes where justified and, on the other, collection of surface water runoff. This Plan mainly concerns the new water storage and the water treatment

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

plant to be constructed next to KhinPonChong reservoir, as significant earthworks will happen very close to the existing reservoir.

Erosion control will include methods that are incorporated into construction practices, as the provision of temporary protection of a mechanical nature (geotextile covering sheets, sediment barriers).

Drainage of the entire area of any construction operations will be provided prior to the start of any other activity. Drained water will be channelled towards one or several sedimentation basins designed following accepted best practice and sized to contain the rainwater falling in 24 hours with a return period of two years.

The contractor will present a Drainage and Erosion and Sedimentation Control Plan setting out the applicable principles and practices adopted for the Project sites concerned. For each site to be opened for construction activities, a detailed plan of the drainage system and the proposed anti-erosion measures will be prepared by the contractor and submitted to the PIC-MEHS for non-objection at least three weeks before starting works on the site. The drainage channel and sedimentation basins will be built as a priority before any other activity is carried out.

9.6.5 PAC-05: MANAGEMENT OF CAMPS

The following obligation will apply for any site sheltering workers on a 24 hrs. basis, including both permanent camps only dedicated for the residence of the workers and the temporary camps implemented on the construction sites where few workers may stay permanently (also to guard equipment and material at night).

A permanent and temporary camp management program will be prepared by each concerned contractor. The various aspects covered by such a program will include:

- choice of location for the camp, proposed organization, controlled entry;
- installations proposed for water supply and sewerage, waste management and drainage of storm water;
- equipment chosen for the sanitary facilities, collective equipment, bedrooms and dormitories;
- anticipated catering and food supply services, particularly canteens; means for monitoring the quality of foodstuffs stored and distributed in the camp;
- the policies implemented with regard to prevention of drug and alcohol abuse.

The specifications of the Tender Documents will lay down the requirements regarding water supply and sewerage. In order to eliminate the risks of development of disease vectors, rainwater drainage will be provided. The ratios to be respected in terms of sanitation (number of toilets, showers and wash-basins) will also be defined. The standards applicable to bedrooms and their furnishing and fittings will also be detailed in the Tender Documents. In particular, the minimum floor space per person, the supply of impregnated mosquito nets and mattresses, will be stipulated.

The procedures to ensure hygiene in all common facilities and in particular food hygiene procedures for storing and monitoring fresh products used by the canteens will be detailed by the contractor responsible.

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

In order to prevent possible abuse of drugs and alcohol, measures to raise the awareness of employees and specific control measures will be set up by the contractor responsible.

9.6.6 PAC-06: PUBLIC HEALTH MANAGEMENT PLAN

The program requirements will be described in detail in the Tender Documents and will cover the following main areas of action:

- First aid facilities established on the construction or camp site; hospital facilities available in Mawlamyine;
- emergency intervention procedures in case of an accident;
- employee surveillance measures: medical check-up on recruitment, annual medical check-up;
- regular cleaning of the sanitary facilities provided, in particular toilets and septic tanks;
- waste management and regular cleaning of refuse bins;
- systematic program to keep employees aware of good hygienic practices;
- monitoring hygiene in canteens;

9.6.7 PAC-07: MANAGEMENT OF AIR QUALITY, DUST AND NOISE

A program to limit atmospheric and noise emissions will be put in place in all areas likely to be affected by construction of the Project. Emissions of exhaust gases and fumes will be limited by appropriate maintenance of equipment and trucks, and by banning the burning of waste on the sites.

Dust caused by road traffic on unpaved surfaces will be subject to reduction measures in residential areas, by requiring the contractor to water spray the ground at regular intervals, i.e. at least two to four times per day during periods without daily rainfall. All loads of fine materials potentially causing dust to be spread during transport will be covered by a tarpaulin. In storage areas, watering will be recommended for all materials likely to generate dust. Wheels of trucks will be washed every time before leaving sites for dredging, to avoid deposition of sludge on public road and later production of dust.

Noise will be the subject of regular monitoring by the PIC-MEHS to ensure that the limits imposed for the site are respected or that the employees exposed to higher noise levels are appropriately equipped with PPE. Measures will be taken to reduce noise levels and the corresponding disturbance on the site and along the access roads: maintenance of plant and vehicles, use of soundproofed equipment, reduction of the hours of use of certain noisy activities.

The Tender Documents will define the thresholds to be respected by the contractor in terms of gas emissions, dust and noise.

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

9.6.8 PAC-08: MANAGEMENT OF ROAD TRAFFIC AND ACCESS

Road traffic is a prime cause of accidents during the construction phase of infrastructure projects. It is therefore essential to regulate traffic both on site and outside. This is particularly important for the present project as (i) components are located in (or close to) dense urban area and (ii) the project shall involve the transport of significant quantities of materials and equipment which may generate heavy truck traffic. Various measures will be considered and adopted by the contractors:

- Awareness raising and training of drivers of trucks on elementary traffic safety rules and on the legal risks : driving under the influence of alcohol or drugs, excess speed, monitoring of tyre condition, load stability, etc.;
- visual acuity of all recruited drivers and their ability to drive;
- provision for parking trucks not encroaching on the roadway;
- respect of speed limitations;

Access to the construction sites will be indicated by appropriate road signals.

The Tender Documents will set out all these obligations as well as the penalties that will be applied to contractors and their sub-contractors in case of infringement.

9.6.9 PAC-09: WATER QUALITY MONITORING (BY CONTRACTOR)

The contractor shall prepare a water quality monitoring plan to appreciate the performance of the environmental management implemented on the sites. This monitoring will control the quality of liquid effluents (waste water, drainage water) leaving the limits of the work site concerned and their compliance with applicable norms or standards provided in the tender Documents.

The contractor will be responsible for monitoring the quality of all discharges leaving its sites or subcontracting a competent consultant or local agency to do so. The parameters to monitor will be defined according to the type of discharge (grey water, storm water) and detailed in the Tender Documents:

Sampling sites and parameters may change in the course of construction in order to adapt to the areas of activity and the types of activity observed, some components being linear. The monitoring will be carried out on a monthly frequency.

This monitoring will be supervised by the PIC-MEHS, who will carry out control measurements at similar location points into his own water quality monitoring process (see the following section related to environmental monitoring of the sites).

Compliance monitoring will concern at least the following water quality indicators:

- organic pollution: BOD5, COD, nitrates, phosphates, coliforms, (particularly related to the camps areas);
- oils and grease, relating to drainage water from the areas used for mechanical activities, storage of hazardous substances (hydrocarbons) and wastewater from canteens;

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

- suspended solids in drainage water and used also as performance criteria for the dredging activities and for sedimentation basins;

9.6.10 PAC-10: PROTECTION OF CULTURAL RESOURCES

The IEE confirms that the project components are not affecting any cultural site or building. However, as some components involve significant excavation (particularly for the rehabilitation of the water supply network, the chance to find any physical cultural resource does exist.

The Tender Documents will define an emergency intervention procedure (chance to find procedure) in case a discovery is made or an interaction is observed during the works. This procedure will include aspects such as:

- immediate measures to stop work at the site concerned and mark out the area to be protected;
- information procedure involving the CC-EHSC, the PIC-MES and PMO-DES;
- approval of the measures decided by the DES;
- organization of removal of the resource (if physical);
- closure of the incident and resumption of work.

9.6.11 PAC-11: EHS TRAINING PLAN

The objective of this plan is to ensure effective implementation of the measures proposed under the EMP on the construction sites. This Plan will define the general training programs (awareness training) for the attention of all personnel and the specialized training programs intended for the employees involved in particularly sensitive activities from the environmental standpoint (management and distribution of hydrocarbons, hazardous waste management, etc.). Each new recruit must participate in the awareness-raising program within 15 days following his recruitment. Each employee in charge of sensitive activities will follow a catch-up session every 6 months.

This training will be delivered by the CC-EHSC of the main Contractors or by a specialized consultant appointed by the contractors. All personnel shall be trained. The sessions shall be recorded in a register where the names and attendance signatures of all participants will be noted.

The environmental management awareness program on the sites will cover at least the following priority subjects:

- rules for waste management within the sites;
- rules for management of hazardous substances and wastes, particularly their storage authorized exclusively in specially adapted areas;
- pollution control, in particular the response required in case of an accidental pollutant spill;
- protection of sites against fire;
- protection of sites against erosion and sedimentation;
- procedure to follow in case of discovery of a physical cultural resource;
- rules for traffic safety on public roads and within the sites;

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

- principles for saving energy and other resources;
- applicable penalties in case of infringement against the established rules.

Complementary training sessions will be made relating to hygiene, health and safety including:

- Hygiene and basic public health issues;
- Safety rules on-site and off-site;
- Emergency response in case of accident;
- Personal and collective protective equipment and measures;
- Safety measures in public areas;
- Electricity hazards;
- Fire control and fire protection;
- Works in elevation and scaffolding safety.

9.7 E&S Supervision during Construction

The Project Implementation Consultant (PIC), through its Manager Environment Health and Safety (MEHS) and his team, is responsible for ensuring the Contractor complies with its E&S obligations. The PIC is the one that certifies payments to the contractor and as such, he can therefore 'negotiate' the deployment by the contractor of equipment or labour initially allocated to the works in favour of specific environmental measures.

9.7.1 PAC-12: MONITORING OF CONSTRUCTION ACTIVITIES (PIC)

Contractors' compliance with their environmental and social obligations will be the subject of a specific monitoring process, coordinated by the PIC-MES. In order to ensure compliance with E&S requirements and efficient implementation of corrective measures an environmental monitoring program will be set up, including:

- E&S supervision of the contractors: Through regular site inspections the objective is to ensure that all EHS measures set out in the obligations for Contractors and in the Action Plans prepared by the Contractors are effectively and efficiently implemented;
- Environmental quality monitoring: monitoring of changes in the quality of the environment in order to evaluate the efficiency of the mitigation measures applied and, if necessary, to modify acceptability thresholds or methods;
- Environmental compliance control monitoring: ensuring that all discharges from all project sites are compliant with environmental legislation or with related specifications in the Tender Documents (under the responsibility of the Contractor, see PAC-09 above). This monitoring will also confirm or not the validity of information supplied by the CCs on a monthly basis. Analysis will be performed on a limited number of parameters indicators of pollution from construction activities.

Weekly Inspections

Weekly inspection of the different work sites will be organised by the PIC-MEHS and will be the subject of a report using a standard inspection sheet. This information

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

sheet will cover all the environmental specifications imposed to the contractor, item by item, giving an immediate overview during each inspection, of potential situations of non-conformity.

Each environmental event (EE) will be the subject of a standard record sheet to be filled in by the observer (Inspector) and submitted to the PIC-MEHS for action. The record sheet signed by the PIC-MEHS is handed over to the CC-EHSC who then completes the document by explaining the proposed corrective measure. If the solution is acceptable, the EE is closed after checking that the corrective measure has been effectively and successfully implemented.

Coordination Meeting

Regular (weekly or semi-monthly) coordination meetings will be held between the CC-EHSCs (and their inspectors) and the PIC-MEHS (and his inspectors), during which they discuss the EE in progress, the remedial measures taken and any other subject of current concern such as the Action Plans presented by the CC-EHSCs.

9.7.2 PAC-13: AIR QUALITY AND NOISE MONITORING (PIC)

The main anticipated impact will be caused by dust near the construction sites. No significant problem is seriously anticipated with exhaust emissions, except very locally along hauling routes.

Two types of sampling monitoring are under the responsibility of the PMO:

- ad-hoc controls for dust at the boundaries of construction sites near residential areas and along hauling routes used between the dredging sites and WWTP site to be filled. Action will be taken as soon as few complaints from residents have been collected for a particular location, or where visual inspection confirms that excessive dust is being generated. The PIC-MEHS will make spot checks of noise levels on the various work sites and in certain residential areas during daytime and night, in order to check that applicable references at the boundaries of the work sites or in the surrounding residential areas are complied with.
- regular monitoring for air quality and noise carried out by an external registered laboratory on a semi-annual basis. Locations may vary according to progressive transfer of activities, particularly for the road works.

Proposed Monitoring Plan is detailed in **Table 9-3**.

Table 9-3: Environmental Monitoring for Air and Noise

REFERENCE	PARAMETERS	LOCATIONS	FREQUENCY
Ambient air quality standards: Ministry of Health	CO, SO ₂ , NO _x , TSP, O ₃ , lead dust (Pb), (PM10), (PM2.5),	3 sites WTP and storage 1 site 3 storages (rehabilitation) 2 sites (mobiles) WS network	Quarterly
Noise level standards: Ministry of Health	Day time and night time noise levels dB(A)		

For the quarterly monitoring of air quality, the PIC-MEHS will appoint a registered professional laboratory to perform the task.

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

All results will be checked against MONREC Environmental Quality (Emissions) Standards, 2015. Any non-compliance detected will require immediate correction from the Contractor.

9.7.3 PAC-14: SITE CLEANING AND REHABILITATION PROGRAM

By the end of the construction activities, each contractor has to decommission the sites where its activities for Project needs have been performed, which includes:

- The demolishing of all temporary structures/buildings developed for the purpose of Project construction.
- The removal from the sites of all equipment and remaining material and waste, the safe disposal or recycling of construction and demolition waste and of construction material;
- The restoration of the land in order to return it as close as possible from its initial state
- The official handover of the site to its owner, signed by parties.

In order to ensure that this Site Cleaning and Rehabilitation (SCR) operation is successfully implemented, the Contractor will be required to prepare a Site Cleaning and Rehabilitation Plan (SCRP) which provides operational methods for (i) site assessment and (ii) cleaning and rehabilitation in compliance with Contractual obligation and international good practices. The Plan will respect the following:

Cleaning Stage

- All construction materials, equipment, buildings, facilities and residual waste will be removed from all sites, except if a site specific decision modifies this principle. This decision shall be commonly agreed on by the CC and the PMO.
- All waste collected on site will be treated in compliance with the requirements of the Tender Documents Environmental Obligations and the Waste Management Plan prepared by the CC at the start of the construction, depending on the classification of the waste product considered.
- Recycling of waste will be maximized.

The Plan will be submitted to the PIC-MES not later than 1 month before the start of decommissioning and include the methods for carrying out the following activities:

- Evaluation of quantities regarding each group of materials/waste identified;
- Identification of registered companies for the recycling of materials and waste;
- Procedures for treatment and disposal of non-recycled material and waste;
- Schedule for cleaning operations;

Rehabilitation Stage

Rehabilitation will be carried out in immediate continuation or even in parallel with the cleaning stage, taking advantage of the presence of the manpower and the equipment. Consultation with concerned stakeholders will be carried out where necessary. The following principles will apply:

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

- Sites shall be rehabilitated in a way to restore, as much as feasible and reasonably possible, the original use of the land;
- All sites must be returned free of any buildings or infrastructures developed for the purpose of Project construction, except if specific request is made;
- All sites where structures were temporary removed (market stalls, shops, other) will be reinstalled at the end of the works, excepts if special request from the owner.
- All spoil disposal areas shall be rehabilitated according to the obligations of the Tender Documentation and the obligations of the Plan on Sediment and Spoil Management.
- Rehabilitation option will eventually be selected through consultation between CC, PIC, PMO and any private party if the land is privately owned.

After completion of SCR works, the CC will inform the PIC-MEHS regarding the final site status. After acceptance by PIC-MEHS of the site conditions MTDC/PMO will be notified. To finalize the SCR process a joint site visit with all concerned parties will be organized by the PIC-MEHS to sign SCR Completion Certificates as follows:

- For public land, the SCR Completion Certificate will be signed by PIC, PMO and by MTDC Land Services as witness;
- For private land, the SCR Completion Certificate will be signed by the land owner, CC, PIC and PMO.

9.8 Action Plan for Operation stage

The implementation of environmental monitoring is necessary from the time the works are completed and commissioned, in order to ensure impacts and mitigation measures proposed have been efficiently implemented during the construction stage and show positive results as expected.

The start of the operation stage will vary depending on the project components considered. The total project construction is anticipated to last 5 years. Due to the type of sub-components concerned, only a water quality monitoring of the resources used to supply Mawlamyine is anticipated.

9.8.1 PAE-01: WATER QUALITY MONITORING OF KHINPONCHONG RESERVOIR

Monitoring of KhinPonChong reservoir in order to ensure water quality remains stable on the long term and fully compatible for domestic water supply purpose.

Sampling will be carried out on a semi-annual basis (one sampling in wet and in dry seasons) close to water intake in KhinPonChong.

- On site measurement: Temperature, EC, dissolved oxygen, pH, turbidity;
- Physical and chemical analysis: BOD, COD, Total Suspended Solids, Total Phosphorus, Phosphate, Total Nitrogen, Nitrates, Ammonia Nitrogen, Ammonium, Sulphates, Chloride, Calcium, Magnesium, Sodium, Potassium, Alkalinity (Bicarbonate HCO_3^- and Carbonate CO_3^{2-});
- Total and faecal coliforms;

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

- Heavy metals (during dry season sampling only): Iron, Lead, Cadmium, Chromium, Zinc, Copper.

PMO shall appoint a certified laboratory in Myanmar to carry out the KhinPonChong monitoring program.

Exact location of sampling sites shall be determined after the completion of the detailed design. Sampling of water resource will be complemented by the daily/monthly monitoring of distributed water carried out by the operator of the WTP.

9.8.2 PAE-02: MONITORING OF TREATED WATER SUPPLY QUALITY

The Operator of the WTP shall be requested to monitor on a daily basis the safety of the water supplied to the system. Sampling shall be done at the 4,000 m³ reservoir before water enters the network and at tap level (4 random sites every day). Parameters controlled daily include residual chlorine for all sites and coliforms for any sample measured with residual chlorine lower than 0,5 mg/l.

9.8.3 PAE-03: MONITORING OF WTP SLUDGE

The operator of the WTP shall be requested to monitor twice a year the quality of the sludge delivered to the landfill. Parameters to control include: pH, EC, N, NH₄, P₂O₅, K₂O, Ca, Mg, Al, Cu, Fe, Mn, Zn, Cd, Cu, Ni, Hg, Pb, Helminth eggs, salmonella, odour.

9.8.4 PAE-04: MONITORING OF TUBEWELLS AROUND THE LANDFILL

5 monitoring tubewells to control any contamination of underground water around the landfill have been implemented at the start of the construction. These tubewells will continue to be monitored by the operator of the landfill during the operation of the landfill and even during at least 5 years after its eventual closing.

Sampling shall be organized on a semi-annual basis including the control of the following parameters: pH, EC, BOD₅, COD, TDS, Chlorides, Sulphates, Phosphates, Total N, Ammonia-N, Nitrate-N, Mn, Fe, Cu, Cd, Ni.

Should the results prove that no contamination is observed, sampling on an annual basis shall be sufficient.

9.8.5 PAE-05: MONITORING OF GAS EMISSION AT LANDFILL

The owner/operator of the landfill will also be required, for health and safety concerns, to regularly monitor landfill gas (LFG). Monitoring is intended to detect unacceptable gas emissions resulting from landfill operations. Methane (CH₄) and carbon dioxide (CO₂) are the major constituents of landfill decomposition gas; other gases present in trace quantities include non-methane organic compounds (NMOCs), hydrogen sulfide (H₂S), nitrogen (N₂), hydrogen (H₂) and oxygen (O₂).

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

Gas will be controlled on a monthly basis the first year of operation, then reduced to quarterly control if results are below applicable limits. Any control detecting above standard value will re-activate monthly controls for at least 3 months.

the concentration and migration of methane, CO₂, H₂S, O₂ and percent lower explosive limit (%LEL, a concentration of 5% methane in the air). Hazardous conditions are not considered to be present on a landfill when methane concentrations are less than 25% of LEL in facility structures, and when the concentration of methane gas does not exceed the LEL (5% by volume) at the property boundary. Air sampling and analysis shall be carried out by a registered laboratory in Myanmar. Cost of monitoring will be supported by the owner/operator.

9.8.6 PAE-06: MONITORING DISCHARGE FROM LEACHATE TREATMENT PLANT

Monitoring of Leachate Treatment Plant discharge water quality in order to ensure water quality remains in compliance with the national emissions standards of MONREC

Sampling will be carried out on a daily basis tracking the parameters included in the standard and including the following general parameters on at least a monthly basis. In addition specific parameters related to new standards for municipal solid waste emissions will be monitored as agreed with MONREC prior to construction.

- On site measurement: Temperature, EC, dissolved oxygen, pH, turbidity;
- Physical and chemical analysis: BOD, COD, Total Suspended Solids, Total Phosphorus, Phosphate, Total Nitrogen, Nitrates, Ammonia Nitrogen, Ammonium, Sulphates, Chloride, Calcium, Magnesium, Sodium, Potassium,;
- Total and faecal coliforms;
- Heavy metals (during dry season sampling only): Iron, Lead, Cadmium, Chromium, Zinc, Copper, Mercury.

This monitoring is only reminded in this EMP as it is part of the conventional follow-up and maintenance to be carried out for this type of plant. The cost is not a part of the EMP budget.

9.9 Cost of Environmental Impact Prevention, Mitigation and Monitoring

Table 9-4 sets out the estimated budgets required for implementation of the corrective measures and monitoring activities during the 3 phases of implementation of the Third GMS Project in Mon State. The budget presented is exclusive of salaries and supporting facilities (transport, office equipment, secretarial services) for staff from PMO and PIC dedicated to environmental supervision of construction sites.

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

Table 9-4: Tentative Budget for EMP Implementation in Mon state

No	CORRECTIVE MEASURE / ACTION	RESPONSIBILITY		BUDGET PER YEAR (US\$)	DURATION (YEARS)	TOTAL
		FUNDING	IMPLEMENT			
Program of Action Preliminary to Construction Start (PAP)						50,000
PPA-01	Appointment of PMO-DES	PMO	PMO	(1)	7	-
PPA-02	Environmental Training of PMO-DES & PMO	PMO	PISC/Consult.	15,000	-	15,000
PPA-03	Health & Safety Training of PMO-DES & PMO	PMO	PISC/Consult.	15,000	-	15,000
PPA-04	Preparation of Communication instruments	PMO	PISC	10,000	-	10,000
PPA-05	Preparation of Contractor E&S specifications	PMO	PISC	10,000	-	10,000
Program of Actions in Construction Phase (PAC)						100,000
PAC-01	Waste Management	Contractor	Contractor	(3)	5	-
PAC-02	Hazardous Substances Management	Contractor	Contractor	(3)	5	-
PAC-03	Accidental Spill Preparedness and Response	Contractor	Contractor	(3)	5	-
PAC-04	Erosion and Sediment Control	Contractor	Contractor	(3)	5	-
PAC-05	Management of Camps	Contractor	Contractor	(3)	5	-
PAC-06	Public Health Management	Contractor	Contractor	(3)	5	-
PAC-07	Management of Air Quality, Dust and Noise	Contractor	Contractor	(3)	5	-
PAC-08	Management of Road Traffic and Access	Contractor	Contractor	(3)	5	-
PAC-09	Monitoring of Water Quality (by CC)	Contractor	Contractor	(3)	5	-
PAC-10	Protection of Cultural Resources	Contractor	Contractor	(3)	5	-
PAC-11	EHS Training Plan	Contractor	Contractor	(3)	5	-
PAC-12	Monitoring of Construction Activities	PMO	PISC	(2)	5	-
PAC-13	Air Quality & Noise Monitoring (PMO)	PMO	Laboratory	10,000	5	50,000
PAC-14	Monitoring of Water Quality (by PMO)	PMO	Laboratory	10,000	5	50,000
PAC-15	Site Cleaning & Rehabilitation Program	Contractor	Contractor	(3)	5	-
PAC-16						
Operational Phase Action Programme (PAE)						75,000
PAE-01	WQ Monitoring of KhinPonChong	MTDC	Laboratory	15,000	5	75,000
PAE-02	WQ monitoring of treated water supply	MTDC	WTP Operator	(4)		-
PAE-03	Monitoring of WTP sludge	MTDC	WTP Operator	(4)		-
PAE-04	Monitoring landfill tubewells	MTDC	WTP Operator	(4)		-
PAE-05	Monitoring landfill Gas emission	MTDC	WTP Operator	(4)		-
PAE-06	Monitoring leachate treatment plant	MTDC	Landfill Operator	(4)		-
	TOTAL	-	-			225,000
	Contingencies 20%	-	-			25,000
	TOTAL	-	-			250,000

Notes: (1) Budget internal to PMO operation costs

(2) Budget is part of PIC Contract

(3) Related E&S expenses are included into construction costs of the CCs

(4) Control and Opex under routine maintenance of facility

10 CONCLUSIONS

The Third GMS Corridor Town Development Project focuses on the town of Mawlamyine in Mon State. The Project intends to significantly improve the environmental conditions in Mawlamyine 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:

- Improvement of the water supply efficiency by the improvement of KhinPonChong reservoir water resource mobilisation;
- Improvement of water supply security by increasing the water supply storage capacity through (i) the construction of a new 4,000 m³ new water storage, located next to the proposed water treatment plant and (ii) the rehabilitation of the 3 existing storages of Kan Thone Kan;
- Improvement of public safety through the construction of a water treatment plant based on rapid sand filtration process with disinfection by chlorine;
- Improvement of distribution networks and extension over the whole town of Mawlamyine;
- Improvement of quality of life and reduction of public health risks related to water.

Solid waste management is a major environmental issue in Mawlamyine where only 50% of the solid wastes are collected at present. The remaining 50% are dumped all over the city where the waste either decay with unpleasant smells and proliferation of insects or is burnt by the residents with emission of unpleasant and dangerous smokes as materials like plastics are also burnt. The collected waste is disposed in a large dumping site where it is regularly burnt in dry season and from where untreated leachates are discharged into the surface water bodies. 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 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 in 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;
- 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;
- Reduction of public health risk particularly among the population of waste pickers through the construction of an incinerator facility for the treatment of medical waste from the several hospitals and clinics and presently disposed in the dumping site without any precautionary measure.

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

Cultural heritage in Mawlamyine is mainly represented by buildings dated from the British era, and for most of them, in very poor conditions. The project intends to stimulate the rehabilitation of such buildings with the objectives to

- improve the general urban landscape and city beautification;
- stimulate the returns from the development of tourism;

The proposed acquisition of private land (3.7 acres or 1.5 ha) to build the future sanitary landfill near MuYong Village in Kyaikmayaw is only involving agricultural land. Then it will affect no household.

The only affected households are the waste pickers living in the existing dump site area that will be closed. Details regarding their affection are available in resettlement plan report.

Except these 1.5 ha, the Project components do not require land acquisition as all new components are developed on MTDC or Mon Government land and others rehabilitated are in public areas (water supply networks).

None of the Project components involves significant forest clearing or encroachment into wetland or other conservation area.

The project will support innovation with the construction of the first composting plant in Myanmar, attached to the landfill and will equip the 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 Mon State shall reduce the annual emissions of GHG from generated waste by more than 42,000 t CO₂-eq/year in 2020 and even by 132,000 t CO₂-eq/year in 2040 when compared to a situation without Project. From 2016 to 2040, the reduction of cumulated GHG emissions shall be reduced by more than 2 million tons CO₂-eq.

The IEE also considered climatic trends at the national, regional and local scale in Myanmar and more specifically in Mawlamyine for which long term climatological data is available. Both temperature and rainfall show increasing trends in Mawlamyine along the last 50 years of observations, in line with MONREC trend analysis for Mon State. Annual rainfall increased by 500 mm over a 50 years period, or a raise of about 100 mm/decade. The month of July shows the highest raise during the 50 years period, about 300 mm, followed by May with 120 mm. Other months are almost stable or show only slight increase.

Temperature also increased over the same period. The average annual maximum temperature rose by 1.1°C over the last 48 years, or an increase of about 0.23°C per decade, a value significantly higher than what is considered in the Mon State (0.14°C increase per decade). July and November are the months showing the highest raise over the period, about 2°C. According to IPCC, sea level rise could reach 0.82 m by the end of the century. The present project considers a safety over-elevation of 1 meter as a design criteria for concerned project components, to avoid long term flooding risk.

The results of AWARE 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 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

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

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 Mawlamyine in a flat or smoothly undulating area, the risk for landslide may be considered as low. Mawlamyine experiences infrequent flooding mainly localized next to the Thanlwin River which may affect the strand road, but hardly more of the urban area as the elevation raises quickly by several meters. None of the Project sub-component is localized in flood prone area. The WTP, located next to the KinPonChong reservoir is designed to be higher than the maximum elevation of water in the reservoir. 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 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 Mawlamyine, some potential risks of limited importance 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 easily avoided by appropriate management measures already discussed in the IEE. Monitoring of KinPonChong and of treated water is considered to ensure compliance.
- 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. Monitoring of gas emission, leachate and adjacent underground water table is considered to ensure compliance.

The EMP also emphasizes the low level of consideration for occupational health and safety (OHS) in Myanmar but also in Mawlamyine nowadays. Construction sites generally ignore safety signals, personal or collective protections for workers, safety belts, EHS awareness training, public safety measures for activities in populated areas etc. This situation is not compliant with the EHS requirements of international lending organisations as the ADB. For that reason, the EMP emphasises (i) the need for EHS capacity building for MSG, MTDC, 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.

IEE REPORT-MON STATE

TA 8758 – Preparing Third GMS Corridor Towns Development

