Environmental Assessment Report

Initial Environmental Examination
Project Number: 47086
May 2014

MYA: Maubin-Pyapon Road Rehabilitation Project

Prepared by the Ministry of Construction for the Asian Development Bank

CURRENCY EQUIVALENTS

(As of 30 April 2014)

Currency Unit		Myanmar Kyat (K)
$1.00	=	K963.05
K1.00	=	$0.0010

ABBREVIATIONS

ADB	Asian Development Bank
CEMP	contractor's environmental management plan
CSC	construction supervision consultants (also called the Engineer)
dB(A)	A-weighted sound scale
DO	dissolved oxygen
EIA	environmental impact analysis
EMP	environmental management plan
GRM	grievance redress mechanism
IEE	initial environmental examination
IES	international environment specialist
km	kilometer
LGU	local government unit
m	meter
mm	millimeter
m^3/s	cubic meter per second
MIMU	Myanmar Information Management Unit
MOECF	Ministry of Environmental Conservation and Forestry
MOC	Ministry of Construction
NES	national environment specialist
OCHA	Office for the Coordination of Humanitarian Affairs
PMU	project management unit
PPE	personal protective equipment
PW	Public Works
ROW	right-of-way
SPS	safeguards policy stament
TA	technical assistance
VECC	village environmental complaints committee
ug/Ncm	microgram per normal cubic meter

NOTES

In this report, "$" refers to US dollars, unless otherwise stated.

TABLE OF CONTENTS

List of Tables

List of Figures

I. EXECUTIVE SUMMARY

1. An environmental assessment was made for the Maubin-Pyapon Road Rehabilitation Project. It is an existing road from Maubin through Kyiaklat to Pyapon in the Ayeyarwaddy Division of the Republic of the Union of Myanmar. Its proposed rehabilitation will be funded by the Asian Development Bank (ADB). The project is intended to reduce travel times and transport costs in the project area. It is a priority project in the Government's key infrastructure development agenda as it will improve connectivity to the rich agricultural Ayeyarwaddy Delta. It will therefore support inclusive economic growth.

2. Relative to the significance of environmental impacts and risks, this project is deemed Environmental Category B based on ADB's environmental categorization and the type of assessment warranted is an Initial Environmental Examination (IEE) report. This IEE was carried out under ADB's TA 8251-MYA[1] in accordance with ADB's Safeguards Policy Statement (SPS, 2009) and the requirements of the Republic of the Union of Myanmar as embodied in Environmental Conservation Law of 2012. As of March 2014, the environmental assessment rules prepared by the Ministry of Environmental Conservation and Forestry (MOECF) in 2012 are awaiting approval by the Parliament. As advised by MOECF, although the environmental assessment rules are yet to be approved, the Ministry of Construction (MOC) will need to prepare an IEE based on government requirements for MOECF's approval prior to commencement of construction.[2]

3. *Project Description*. The project will involve rehabilitation of an existing 54.5 kilometers (km) road from Maubin through Kyiaklat to Pyapon. Project features include the following:

(i) road widening (2.0 x 3.3 meter [m] traffic lanes with 1.8 m sealed shoulders each side, asphaltic concrete) except in Kyiaklat and Pyapon (2.0 x 3.5 m traffic lanes only, cement concrete);
(ii) raising the road elevation by average of 0.25 m in rural areas and by approximately 0.10 m in Kyiaklat and the bridges and box culverts between Km 0 and Km 13;
(iii) Kyiaklat Oo Yin Chaung bridge (km 26.4) to be upgraded from a single lane steel bridge to a 2-lane concrete bridge, and Kyee Chaung Bridge (Km 28.4) to be upgraded to 2-lane concrete bridge standard;
(iv) widening or replacement of bridge over Pagoda Creek (Km 33.7);
(v) structural works and repairs on bridges and culverts, where required;
(vi) new surface on bridge decks, where required;
(vii) improved road safety features such as signs, pavement marking, guardrail, and better intersections; and
(viii) provision of bus bays and loading areas close to intersection of minor roads and waterways.

4. The procurement process is scheduled to commence in April 2014, and construction is expected to start in January/February 2015. The rehabilitated road is expected to be fully operational by end of 2018.

5. *Environmental and Socioeconomic Conditions*. The present ecological setting of the area traversed by the Maubin-Pyapon Road is an agricultural landscape dominated by rice paddies. The rice paddies occupy most of the area immediately adjacent to the road and

[1] ADB. 2012. *Technical Assistance to the Republic of the Union of Myanmar for Capacity Building Support for Project Identification*. Manila.
[2] Meeting between MOC, MOECF and ADB on 28 February 2014.

further beyond. The entire road corridor is not within or adjacent to a protected area or a mangrove area. The three towns of the Maubin-Pyapon Road had a combined population of about 860,000 in 2011. Maubin has the largest population, followed by Pyapon, and Kyiaklat. About 87% of the project area's population is rural, and the remaining 13% is urban, mostly within the 3 project towns. The towns have a population density of 200 to 364 persons per square kilometer, the highest density in the Ayeyarwaddy Division. Rice is the principal crop which gives the Ayeyarwaddy Division the title of "rice granary of Myanmar." In addition to rice, other crops include maize, sesame, groundnut, sunflower, beans, and jute. In 2008, Kyiaklat District was reported to be the largest summer rice producer in Myanmar with 118,700 acres planted with rice.

6. *Impacts and Environmental Management Plan (EMP)*. A comprehensive screening for environmental impacts was made for the Maubin-Pyapon Road Rehabilitation Project. A screening checklist was developed to help identify which topics do not require further attention. For the pre-construction phase, the road was screened for potential environmental impacts related to its design and location. There are no issues related to: (i) alteration of surface hydrology, (ii) encroachments into environmentally sensitive areas, or (iii) impacts and risks to biodiversity conservation. An important fact to consider for this project is that the Maubin-Pyapon Road is not within an undisturbed landscape. This road has been functional for 19 years since it was first constructed in 1993, and probably for many years earlier than this as an unimproved track. Hence, over the years the ecological changes due to human activities in the area have resulted in the present agricultural landscape. Beyond the road corridors, the land is basically cultivated strips of land dominated by rice paddies. The entire area is not within or adjacent to a protected area or a mangrove area.

7. Climate change vulnerability was examined. The existing Maubin-Pyapon Road showed some resilience when a large flood occurred in 2008 through the Ayeyarwaddy Delta due to Nargis, a strong cyclone. According to the local people, the road remained above flood water levels even if the surrounding areas were severely flooded at that time. Based on the natural hazard risk map of Myanmar (Office for the Coordination of Humanitarian Affairs [OCHA], 2011), the area is within a tropical storm intensity zone 1 (118–153 km per hour on the Saffir-Simpson Scale). A category 1 cyclone will have a 10% probability of striking in the next 10 years. However, Nargis, a category 3 cyclone, struck the Ayeyarwaddy Delta on May 2008 with a wind speed of up to 200 km per hour and heavy rain. The road is to be raised by 0.3 to 0.9 m for design reasons related to flood levels and pavement strength considerations. In the absence of specific information about the project area's susceptibility to climate change impacts, this higher impact will provide a measure of protection against future higher flood levels.

8. During construction, there are no issues related to displacement of rare or endangered species. Also, no significant issues were found relating to: (i) modification of construction site topography, (ii) river erosion due to river sand removal, and (iii) removal of special status trees.

9. Other potential environmental impacts related to construction activities are: (i) soil erosion and sedimentation at and near construction sites, (ii) construction noise and vibration, (iii) local air pollution due to construction activities, (iv) oil and other hazardous materials releases, (v) vehicular traffic congestion and public access disruption, (vi) hazards to the public due to construction activities, (vii) pollution and health risks arising from workers camps, (viii) occupational health and safety at work sites, and (ix) improper closure of construction sites after project completion. Consistent with ADB's SPS, this IEE also assessed impacts of the project to socioeconomic and physical cultural resources. Mitigation measures have been developed for the negative environmental impacts related to construction activities for inclusion in the works specifications to ensure their implementation.

10. Operation phase impacts are: (i) pavement failure and adjacent land waterlogging due to clogged or inadequate drainage facilities, (ii) increased risk of road accidents, and (iii) increased risk of pollution of waterways. Increased noise and vibration levels and increased air pollution due to increased vehicular traffic were found not to be significant since the expected increase in vehicular traffic is not enough to raise levels for these impacts. However, rehabilitating the Maubin-Pyapon Road has significant positive impacts to the served communities. The road will become an all-weather transport link between two of the major urban centers of the southern Ayeyarwaddy Delta. This will help provide the people with better access to markets and will create economic opportunities for them to sell their labor and products. The rehabilitated road will also facilitate access to education and health facilities in Maubin and beyond, including Yangon, for people in Pyapon, Kyiaklat, and towns to the south of Pyapon.

11. An EMP for the rehabilitation of the Maubin-Pyapon Road has been developed to effectively manage the environmental issues during pre-construction, construction and during the road's operation. The plan includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangements. The EMPs' institutional arrangements, summarized below, define the requirements and responsibilities during the project's pre-construction, construction, and operation phases. The EMP includes tabulated information on: (i) required measures for each environmental impact that requires mitigation, (ii) locations where the measures apply, (iii) associated cost, and (iv) responsibility for implementing mitigation and monitoring measures.

12. *Institutional Setup and Capacity Building.* The institutional arrangements start with MOC as the executing agency for the project. MOC's Public Works (PW) is the implementing agency. The key implementing agency in the field is the Project Management Unit (PMU) reporting directly to the PW Managing Director. For the environmental aspects of the project, a PMU staff member will be designated as the Environment Officer for the project, to oversee the implementation and monitoring of the project's environmental safeguards requirements.

13. The project's civil works will be implemented by contractors selected by MOC in accordance with ADB's procurement procedures. The contractors will be supervised, for compliance with the civil works contract legal and other provisions, by an international consulting firm selected by MOC, also in accordance with ADB's procurement procedures. This consulting firm will be the Engineer for the contracts, as defined in the civil works contract agreements, and will be referred to in this IEE as the Construction Supervision Consultant (CSC). The CSC team will include an International Environment Specialist (IES) who will be supported by a National Environment Specialist (NES). Together, the IES and the NES will be responsible for the following activities related to environmental safeguards: (i) confirming that the EMP has been included in the bidding documents and civil works contracts; (ii) ensuring the contractor's EMPs (CEMPs) are prepared by the contractors, reviewed by the CSC and ADB and approved by the CSC prior to construction commencing; (iii) establishing a system to monitor the environmental aspects of the project including the indicators set out in the monitoring plan of the EMP; (iv) supervising the implementation of environmental mitigating measures required for the construction activities; (v) reviewing, monitoring, and evaluating the effectiveness of the implemented CEMPs, and recommending corrective actions if required; (vi) preparing monthly environmental monitoring reports for the CSC to submit to the PMU; (vii) preparing semi-annual environmental monitoring reports for submission to ADB and public disclosure; (viii) address, record, and report on any grievances arising from the project's environmental Grievance Redress Mechanism (see para. 17 below) in a timely manner.

14. The IES will provide detailed guidance on site inspection and report preparation to the NES. Subsequent monthly monitoring would be carried out by the NES. The IES, assisted by the NES, will undertake semi-annual monitoring and report preparation.

15. MOC/PW need capacity building on environmental monitoring of road construction projects. This project's implementation Pyapon is a good opportunity to introduce the practice of environmental monitoring for infrastructure projects. An important aspect of the IES scope of work will be to provide training and guidance on environmental monitoring to MOC/PW staff.

16. *Consultation and Participation*. Within the context of "meaningful consultation" as required by ADB's SPS, MOC/PW initiated a process of consultation during project preparation and intends to continue it during the construction phase. MOC/PW conducted an initial public consultation and information disclosure on 12 September 2013 with various stakeholders' representative, and concerned individuals from the project towns of Maubin, Kyiaklat, and Pyapon. Details of the proposed rehabilitation of the Maubin-Pyapon Road were presented to the stakeholders and their views were requested. The initial public consultation was conducted in the Myanmar language. Issues that stakeholders raised centered on involuntary resettlement issues such as the occupants within the right-of-way, compensation for land to be used as earth fill material, and arrangements for the removal of the trees that have been planted along the road by the Forestry Department. Stakeholders expressed support for the project, since it would contribute to development of the project area, including in education, health, trade, and its economy.

17. *Grievance Redress Mechanism (GRM)*. Implementation of the project must be fully compliant with ADB's safeguards requirement for GRM. MOC/PW disclosed the proposed mechanism during the initial public consultation on12 September 2013. Prior to the start of construction, the construction stage GRM will again be discussed with people in the project area, particularly during the formation of the village committees that will handle future complaints should they arise. Complaints about the environmental performance of the project during the construction phase can best be handled by various levels incuding an ad-hoc Village Environmental Complaints Committee (VECC). In every village , an ad-hoc VECC is to be established, to be chaired by the MOC/PW representative in the field. Members will include the following: (i) contractor's highest official at the site such as the Contractor's Construction Manager or Construction Superintendent, (ii) village chief or representative, and (iii) a women's organization representative. The requirement for the establishment of the VECC and its operation, including the procedures for filing of complaints, will be included in the EMP for each civil works contract.

18. *Conclusion and Recommendation*. Based on the screening for potential environmental impacts and risks, the Maubin-Pyapon Road Rehabilitation Project is not anticipated to have significant negative environmental impacts and risks. Provided that the EMP is enforced, the project can be implemented in an environmentally acceptable manner. There is no need for a further environmental assessment study. Specifically, a full environmental impact assessment (EIA) is not warranted and the project's environmental classification as Category B is appropriate.

19. Implementation of the project should emphasize the following from the environmental perspective: (i) the project's EMP Pyapon will be considered in the road design process; (ii) the EMP will be included in the bidding and construction contract documents; (iii) each contractor will prepare a contractor's EMP (CEMP) before commencement of site works; (iv) the requirement for the establishment and operation of VECCs will be included in the EMPs; (v) MOC/PW will designate a Project Environment Officer who, as a staff member of the PMU, will be responsible for (a) overall environmental monitoring of construction activities; (b) ensuring that the CEMPs are properly implemented and monitored; (c) preparing monthly

and semi-annual environmental monitoring reports; and (d) coordinating with the environment agency, MOECF, to obtain environmental approval for the project before commencement of site works and to ensure compliance with other government environmental requirements; (vi) an IES (part of the CSC team) will assist MOC/PW with monitoring of EMP implementation; provide training to MOC/PW staff in environmental safeguards and monitoring; and assist MOC/PW in preparation of monthly and semi-annual environmental monitoring reports; (vii) monitoring of health and safety requirements in accordance with the EMP will be given importance during construction and operation to reduce risks to the public and to site personnel; and (viii) MOC/PW will continue the process of public consultation and information disclosure prior to and during the construction phase of the project.

I. INTRODUCTION

1. The road from Maubin through Kyiaklat to Pyapon in the Ayeyarwaddy Division of the Republic of the Union of Myanmar is proposed for rehabilitation through funding by the Asian Development Bank (ADB). The project is intended to reduce travel times and transport costs in the project area. It is a priority project in the Government's key infrastructure development agenda as it will improve connectivity to the rich agricultural Ayeyarwaddy Delta. It will therefore support inclusive economic growth.

2. This Initial Environmental Examination (IEE) provides an assessment of the environmental concerns to be considered regarding the project location, planning and design, construction, and operations and maintenance.

3. Preparation of the IEE involved field visits to the project area; review of available information; and discussions with local government officials, local government agencies, and members of the community within the project area.

4. The IEE has been carried out in accordance with ADB's 2009 Safeguard Policy Statement (SPS, 2009) and the requirements describe in its Appendix 1 (Safeguards Requirement 1: Environment) and the requirements of the Republic of the Union of Myanmar as embodied in Environmental Conservation Law of 2012.

II. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

5. The basis for integrating environmental consideration into social and economic development in Myanmar is the National Environmental Policy (1994) which proclaims the government's commitment to the principle of sustainable development. It also highlights the integration of environmental considerations into the development process to enhance the quality of life of all its citizens. The policy was proclaimed through the gazette in accordance with Notification No.26/94 dated 5 December 1994, of the Government of the Union of Myanmar.

6. Following the National Environmental Policy, Myanmar Agenda 21 was developed in 1997 as the blueprint for all natural resource management and environmental conservation work and the pursuit of activities contributing to biodiversity conservation nationwide.

7. In March 2012, the Environmental Conservation Law (2012) was enacted. Its objectives are to: (i) enable the implementation of the Myanmar National Environmental Policy; (ii) enable the laying down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process; (iii) enable to emerge a healthy and clean environment and to enable to conserve natural and cultural heritage for the benefit of present and future generations; (iv) reclaim ecosystems as may be possible which are starting to degenerate and disappear; (v) enable to manage and implement for decrease and loss of natural resources and for enabling the sustainable use beneficially; (vi) promote public awareness and cooperation in educational programs for dissemination of environment perception; (vii) enable to promote international, regional and bilateral cooperation in the matters of environmental conservation; and (viii) ensure cooperation between government departments, government organizations, international organizations, non-government organizations and individuals in matters of environmental conservation.

8. Following the enactment of the Environmental Conservation Law (2012), the Environmental Conservation Department of the Ministry of Environmental Conservation and Forestry (MOECF) was established in October 2012 to: (i) implement the national environment policy; (ii) develop short, medium and long term strategy, policy and planning for the integration of environmental consideration into the sustainable development process; (iii) manage natural resources conservation and sustainable utilization; (iv) manage the pollution control on water, air and land for environmental sustainability; (v) cooperate with government organization, civil societies, private and international organizations for the environmental affairs. MOECF is still in the process of developing the various environmental quality standards for Myanmar.

9. It is worth noting that prior to 1989, no governmental agency was responsible for overseeing environmental matters in Myanmar. However, recent developments showed the government's commitments to mainstreaming environmental assessments in the development process. In 2012, MOECF prepared the draft environmental assessment rules. It was presented on 26 July 2013 in the "Environmental Impact Assessment (EIA) Procedures Workshop" with 150 delegates from the private and public sectors, non-governmental organizations, civil society organizations, and local EIA consultants. MOECF will be the executing agency of the proposed EIA rules as indicated in the draft rules.

10. A draft basis for environmental categorization of projects was also presented in the workshop. The draft "Projects Categorization for IEE and EIA in Myanmar" indicates that all road rehabilitation projects will be required to prepare an IEE regardless of project size. As of March 2014, the environmental assessment rules are awaiting approval by the Parliament. Information on the draft process for environmental permit processing is presented in Appendix 1. As advised by MOECF, although the environmental assessment rules are yet to be approved, MOC will need to prepare an IEE based on government requirements for MOECF's approval prior to commencement of construction.

11. **International Conventions.** Some international conventions are part of the environmental framework since the Union of Myanmar is a party to some international conventions, treaties and agreements on the principles and actions necessary for sustainable development and environmental protection. It has ratified on 1994 both the Convention on Biological Diversity and the United Nations Framework Convention on Climate Change. These international conventions explicitly reference the application of environmental assessment to address the effects of human activities. The Convention on Biological Diversity, in particular, promotes the use of appropriate procedures requiring environmental impact assessment of proposed projects that are likely to have significant adverse effects on biological diversity.

III. DESCRIPTION OF THE PROJECT

A. Location

12. The Maubin-Pyapon Road is an existing 54.5 kilometers (km) macadam-surfaced two lane road on low embankments (0.5 to 1.2 meters [m]) located in the towns of Maubin, Kyiaklat, and Pyapon (Figure 3.1). The project road starts from the outskirts of Maubin and moves southward to the town of Kyiaklat and further down to the outskirt of Pyapon. At Maubin, the road is linked to Maubin-Yangon Road, while at Pyapon it is also linked to another road going to Yangon City.

Figure 3.1: Location Map of Maubin-Pyapon Road

Source: Technical Assistance Consultants. 2013

B. Components and Cost Estimate

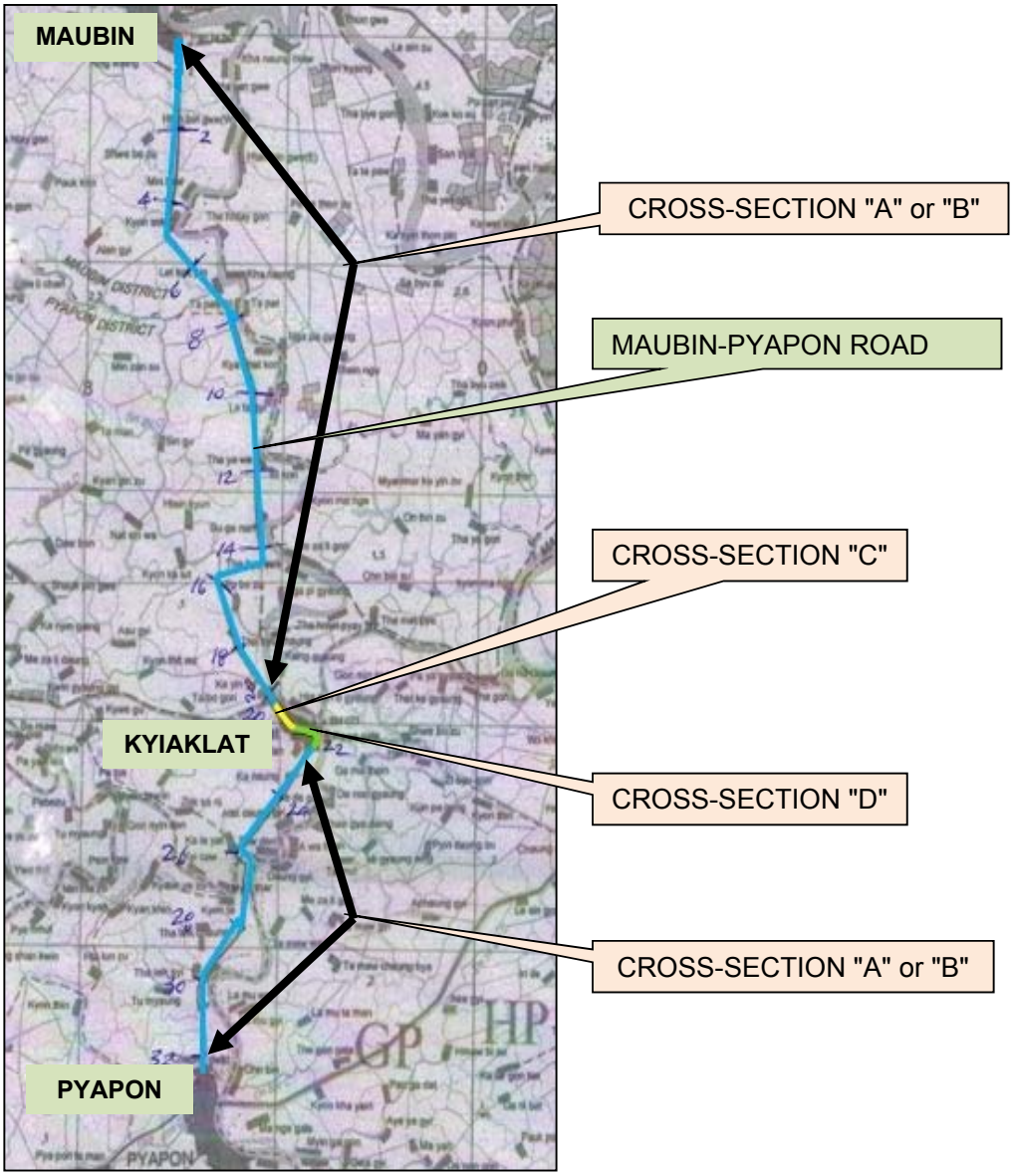
13. Existing paved surface varies between 5.5 to 6.6 m with earth shoulders between 2.0–4.0 m on each side. Road conditions range from fair to very poor. Road surface is deformed and has failed along most sections for at least 25% (and as high as 80%) of the paved area. Project features include the following:

(i) road widening (2.0 x 3.3 m traffic lanes with 1.8 m sealed shoulders each side, asphaltic concrete) except in Kyiaklat and Pyapon (2.0 x 3.5 m traffic lanes only, cement concrete);
(ii) raising the road elevation by average of 0.25 m in rural areas and by approximately 0.10 m in Kyiaklat and the bridges and box culverts between Km 0 and Km 13;
(iii) Oo Yin Chaung bridge (Km 26.4) to be upgraded from a single lane steel bridge to a 2-lane concrete bridge, and Kyee Chaung Bridge (Km 28.4) to be upgraded to 2-lane concrete bridge standard;
(iv) widening or replacement of bridge over Pagoda Creek (Km 33.7);
(v) structural works and repairs on bridges and culverts, where required;
(vi) new surface on bridge decks, where required;

(vii) improved road safety features such as signs, pavement marking, guardrail, and better intersections; and
(viii) provision of bus bays and loading areas close to intersection of minor roads and waterways.

14. Location of proposed typical cross-sections are presented in Figure 3.2, with the details in Figure 3.3.

Figure 3.2: Proposed Road Cross-sections Distribution

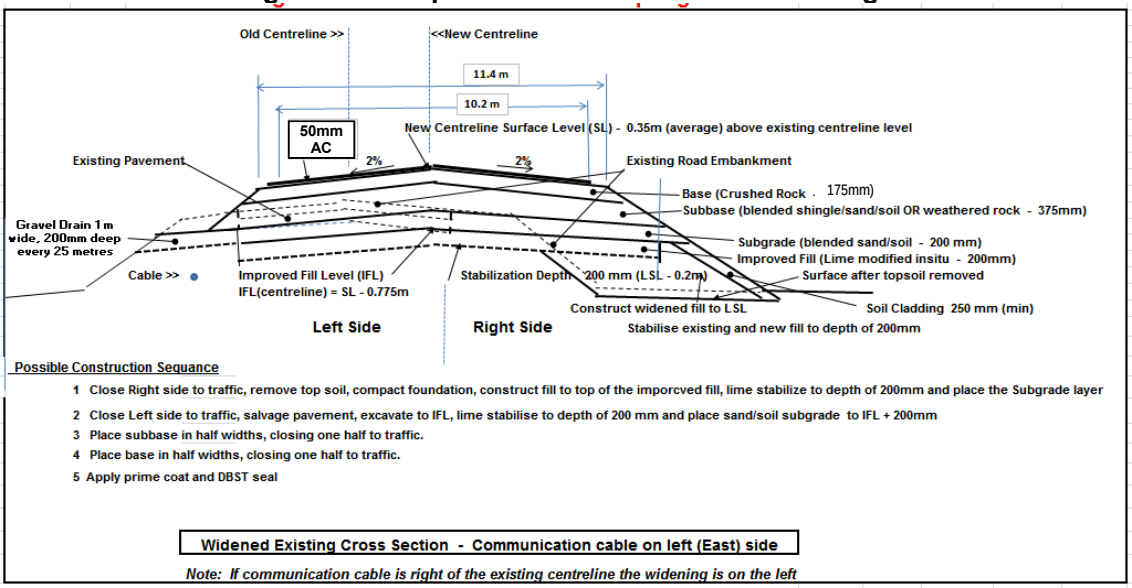


Source: TA Consultants. 2013

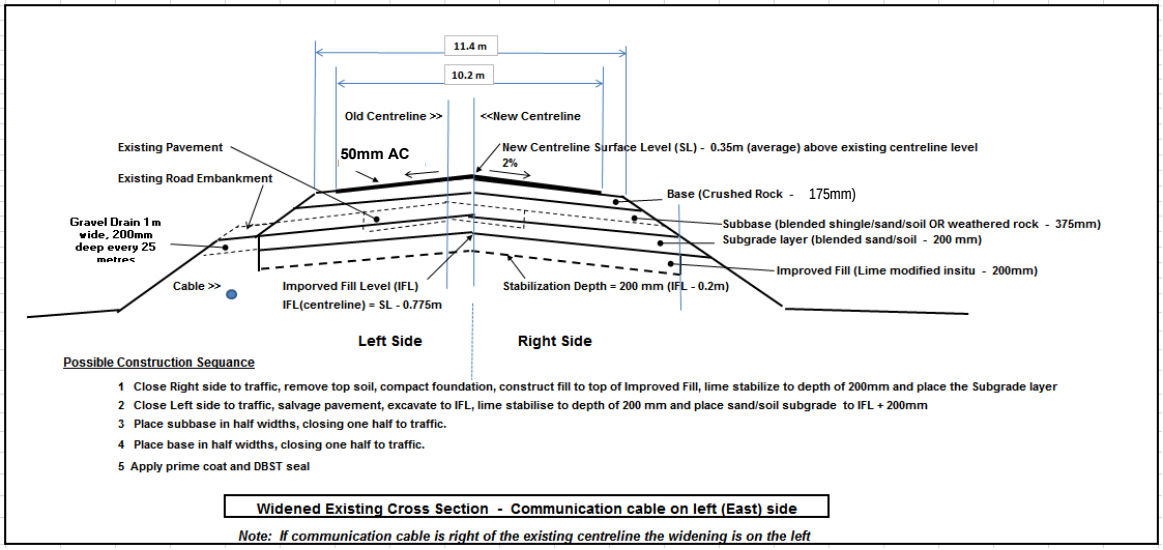
15. Cross-section "A" or "B" are flexible pavement sections with asphaltic concrete surfacing that will be applied will be applied to the entire road, except for the Kyiaklat and Pyapon town sections. The said cross-section types will cover the section beginning at Km 0+000 (outskirt of Maubin) to Km 32+410 (before entering the town center of Kyiaklat) and from Km 35+610 (outside of the town center of Kyiaklat) up to the bridge before entering the town center of Pyapon (Km 53+310). Cross-section "A" is for the sections of the road where the offset of the new centerline is approximately 3 m and the existing road formation

is narrow. Cross-section "B" is for sections of the road where the offset of the new centerline from the existing centerline is 0-1 m, and the existing road is wider. Cross-sections "C" is for parts of the road through a town where there are no kerbs and "D" is for parts of the road through a town where there are kerbs and some drainage provision such as at the Kyiaklat section between Km 32+410 to Km 35+610.

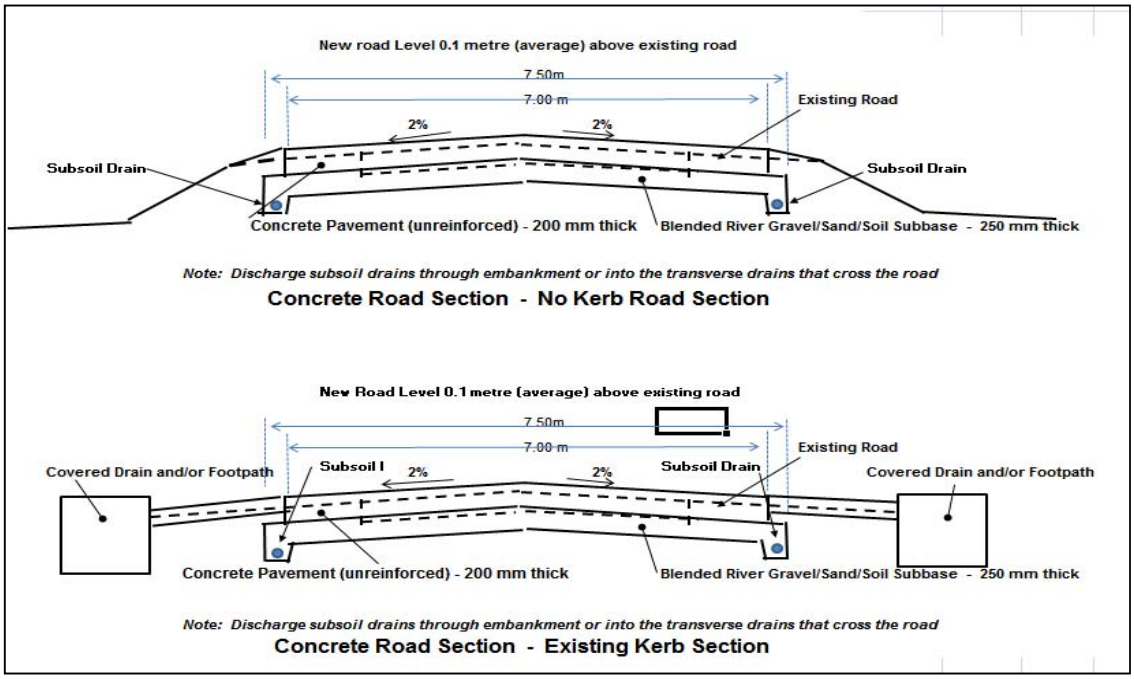
Figure 3.3: Proposed Road Cross-sections Design



Cross-section "A": Typical road cross-section for the sections of the road where the offset of the new centerline is approximately 3 meters and the existing road formation is narrow.



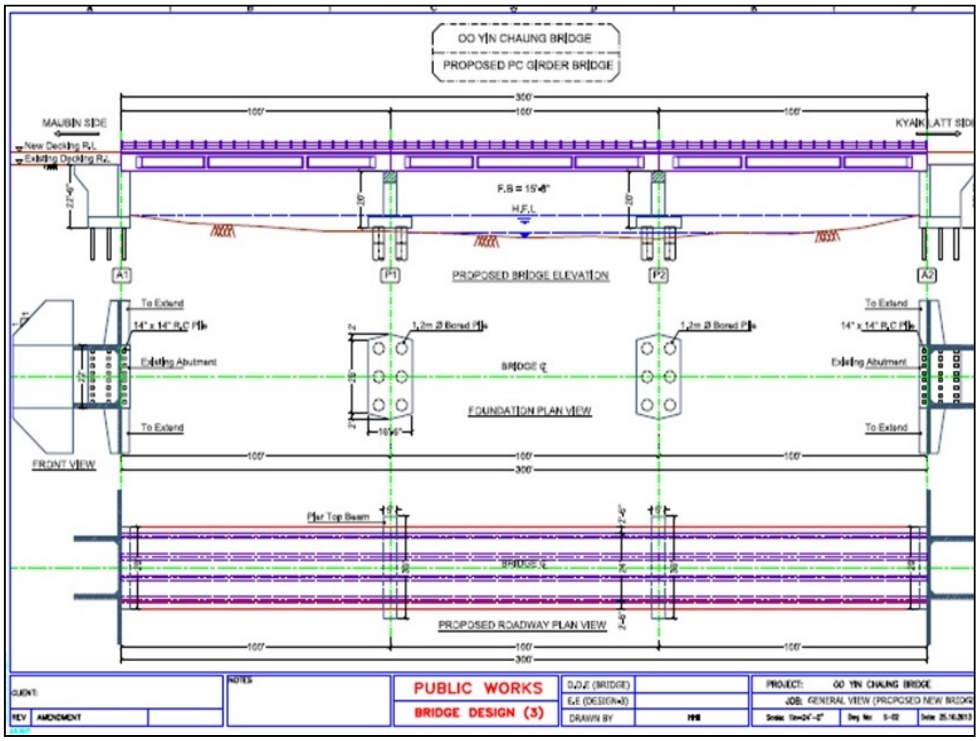
Cross-section "B": Typical road cross-section for sections of the road where the offset of the new centerline from the existing centerline is 0-1 meter, and the existing road is wider.



Cross-sections "C" (top)**:** Typical road cross-section for parts of the road through a town where there are no kerbs and **Cross-sections "D"** (bottom) for parts of the road through a town where there are kerbs and some drainage provision.

16. Proposed General Arrangement for Oo Yin Bridge is presented in Figure 3.4. Oo Yin Bridge, which crosses the Oo Yin Creek, will be using the existing foundation. Additional piling works will be for the bridge abutment.

Figure 3.4: Proposed General Arrangement for Oo Yin Chaung Bridge



Source: TA Consultants. Highway Engineering Report. September 2013.

17. The list of bridges and culverts with possible structural works and repairs is presented in Table 3.1.

18. Total construction base cost is estimated at $47.31 million based on October 2013 prices.

Table 3.1: Bridges and Culverts with Possible Structural Works and Repairs

Location (Km)	Name of Bridge	Type	Length (m)	Width, excluding footpath (m)	Proposed Structural Work	Minor Works/ Repairs	Deck Treatment
2.00	Kyar Ga Yey	Concrete Bridge	3.0	8.5	none	Repair cracked wing wall	350 mm thick pavement to be constructed over the deck
2.60	Ngar Yit Sal	Concrete Pipe	1.0	15.2	Culvert underwater. Culvert should be inspected, pipe needs to be assessed	none	not applicable
3.60	Kha Naung	Concrete Bridge	3.0	8.5	Demolish "right" side kerb and handrail, extend foundation and abutments and deck by 4.4 m	none	350 mm thick pavement to be constructed over the deck
5.40	Pa Kout Toe	Concrete Pipe	1.0	15.2	Culvert underwater. Culvert should be inspected pipe needs assessed	none	not applicable
10.00	Lat Tat Gyi Yoe	Concrete Bridge	4.5	8.5	Demolish "right" side kerb and handrail, extend foundation and abutments and deck by 4.4 metres	none	350 mm thick pavement to be constructed over the deck
11.60	Mayan Yoe	Concrete Pipe	1.0	15.2	Culvert underwater. Culver should be inspected pipe needs assessed	none	not applicable
12.60	Htein Pin Yoe	Concrete Bridge	3.0	8.5	Demolish "right" side kerb and handrail, extend foundation and abutments and deck by 4.4 m	none	350 mm thick pavement to be constructed over the deck
26.40	Oo Yin Chaung	Bailey	91.5	3.6	New sub and superstructure and enlargement of abutment and abutment foundations	Ensure ends of kerb or walkways are ramped to shoulder level over a few metres	new deck
28.40	Kyee Chaung	Concrete Bridge	8.5	4.3	New sub and superstructure and foundations	Ensure ends of kerb or walkways are ramped to shoulder level over a few metres	new deck
32.20	Hlal Sate	Concrete Bridge	27.5	7.3	none	Construct concrete ramp from shoulder level to top	Prepare joint to accept sealant and insert sealant

Location (Km)	Name of Bridge	Type	Length (m)	Width, excluding footpath (m)	Proposed Structural Work	Minor Works/ Repairs	Deck Treatment
						of kerb or walkways on bridge over a few metres	
37.60	Kha Naung	Concrete Bridge	30.5	8.5	none	Construct concrete ramp from shoulder level to top of kerb or walkways on bridge over a few metres	no action
42.00	Gonhnyintan	Concrete Bridge	590.0	8.5	none	Construct concrete ramp from shoulder level to top of kerb or walkways on bridge over a few metres	No action
48.80	Thaleik Kyee	Concrete Bridge	55.0	8.5	none	Construct concrete ramp from shoulder level to top of kerb or walkways on bridge over a few metres	Repair holes in Macadam and apply a seal coat or Cold Mix Asphalt. Prepare joint to accept sealant and insert sealant
49.80	Thaleik Kalay	Concrete Bridge	30.5	8.5	none	Construct concrete ramp from shoulder level to top of kerb or walkways on bridge over a few metres	Concrete deck. Prepare joint to accept sealant and insert sealant
52.80	Zchaung Twin	Concrete Bridge	72.0	8.5	none	Construct concrete ramp from shoulder level to top of kerb or walkways on bridge over a few metres	Prepare joint to accept sealant and insert sealant

km = kilometer, m = meter, mm = millimeter.
Source: TA Consultants. Highway Engineering Report. September 2013.

C. Construction

19. Road rehabilitation works will be within the limit of the 45.7 m road right of way (ROW). Construction activities will include site clearing, removal and recycling of existing macadam pavement, embankment widening, and new pavement installation. Site clearing will include: (i) clearing and grubbing, (ii) cutting, removing, and disposing of trees and stumps, and (iii) demolition, removal, and disposal of structures or parts of structures. Involuntary resettlement issues associated with site clearing is addressed by the Resettlement Plan (separate report) prepared for this project.

20. Existing macadam pavement will be recycled as sub-base material for the new pavement. Widening of the existing embankment will include placing additional fill materials. Road alignment will be moved laterally for 1 to 3 m at some sections to avoid the existing optical fiber cable installed adjacent to the road. Cable will be relocated at about ten locations and possibly at locations adjacent to bridges which cannot be modified. Construction of new pavement in some sections will also involve removal of unsuitable embankment materials to be replaced with new materials. It is expected that there will be no blasting and cuts for the widening activities due to the relatively flat topography of the existing road corridor. New fill materials will be prepared by blending soil, sand, river gravel, lime, and other materials. The place for soil blending will be determined by the contractor but most likely will be in the sources for aggregates or rocks. Locations for blending and storage (some may come from 300 km away and will need to be stored over some months before these are used) is likely to be close to rivers as most of the materials will be delivered by water transport.

21. The final pavement surface will be asphaltic concrete. Asphalt or bitumen will be imported and transported, either by water transport or trucks, to the Maubin-Pyapon Road. The source for bitumen will be determined by the contractor.

22. The contractor is expected to use the typical equipment for road construction such as excavators, scrapers, graders, bitumen trucks, dump trucks, road rollers, asphalt mixing plant, concrete mixers, water trucks, and other small construction equipment such as water pumps. For bridge construction, the contractor will determine the method based on the contract drawings.

23. **Sources of Construction Materials.** The road contractor will decide regarding the sources of materials for the rehabilitation of the Maubin-Pyapon Road. Based on local information, the likely source of aggregates and base materials will be from existing quarries, most probably in Mandalay region, which is some 500 km away from the project site, or Mon State which is about 160 km away. River gravel for sub-base are likely to be sourced from the Ayeyarwaddy River approximately 150 km north of the project. Sand for the blended sub-base and embankment materials are likely to be sourced from the rivers in the project area. Silts and clays that will be needed for blending with the sub-base and subgrade will be sourced from local borrow areas. Materials from Mandalay are expected to be transported through the Ayeyarwaddy River as has been practiced in the area. Embankment fill materials will be difficult to source locally since *in-situ* soil materials along the road corridor are unsuitable without any modifications. These soils could be mixed with local sand and gravel. There is plenty of sand in the Ayeyarwaddy River since the river has been known to carry large quantities of sand from upstream. The abovementioned construction materials will be sourced from commercial suppliers.

D. Implementation and Operation

24. The road will be constructed by private sector contractors. The procurement process is scheduled to commence in April 2014 and construction is expected to start in

January/February2015. Contracts will be supervised by international consultants and will include engineers from Myanmar. The rehabilitated road is expected to be fully operational by end of 2018.

IV. DESCRIPTION OF THE ENVIRONMENT

25. A brief description of the existing environmental and socioeconomic conditions of the Maubin-Pyapon Road influence area is presented in the following subsections:

A. Physical Resources

26. Maubin is a town in the Ayeyarwaddy Division of south-west Myanmar. It is located at 16°43’48" north latitude and 95°39’0" east latitude, with average height of 13 m above sea level. Further south to the end of the project road is the town of Pyapon located at 16°17’46" north latitude and 95°40’48" east latitude. It is located about 15 km inland from the Andaman Sea. In between these two urban centers is the town of Kyiaklat located at 16°26’40" north latitude and 95°43’35" east latitude.

27. *Geology and Topography*. The general area of Maubin-Pyapon Road is in the lowlands near the coastal plains. Mountain chains also divide Myanmar's three main river systems with the Irrawaddy (Ayeyarwaddy), as the longest river, nearly 2,170 km long, and flows through the country and into the sea. The basin was deeply excavated by the predecessors of the Irrawaddy and other rivers. The valleys are now occupied by these rivers, which cover the ancient soft sandstones, shales, and clays with their alluvial deposits (Hadden, 2008).

28. The Irrawaddy River has formed a delta system extending in a great alluvial fan from the limit of the tidal influence near Myanaung to the Bay of Bengal and Andaman Sea, 290 km to the south. This alluvial plain is bounded to the west by the southern Arakan Yoma range and to the east by the Pegu Yoma. The city of Rangoon, situated on the southermost spur of the Pegu Yoma, lies at the southeastern edge of the delta. The entire area is overlain by a thick layer of recent alluvium brought down by the Irrawaddy. In the delta regions formed by the Irrawaddy and Sittang rivers, the landscape is flat, relieved only by few blocks of erosion-resistant rocks that are not more than 18 m high.

29. The project site and adjacent areas including those up to 250 km away from the site are in the earthquake zone of intensity VII of the Modified Mercalli Scale (OCHA, March 2011)

30. *Soils*. The project area soils are of two types, gleysol and solonchak based on Food and Agriculture Organization (FAO) soil classification system. Maubin's soil is gleysol and around halfway down to Pyapon the soil type is solonchak. Gleysol are formed under waterlogged conditions produced by rising groundwater. This type of soil is cultivated for rice after drainage. Solonchak are formed from saline parent material under conditions of high evaporation. It is defined by high soluble salt accumulation within its top 30 centimeters and lacks distinct subsurface layering except for layers showing the effect of water-logging.

31. *Surface Water Resources*. The project site is located within the delta formed by the Irrawaddy River. This river and its tributaries drain about three-fifths of Myanmar. The Irrawaddy River bisects Myanmar from north to south and empties into the Indian Ocean through the Irrawaddy Delta. At the apex of its delta, it breaks up into a vast network of streams and empties into the Andaman Sea through multiple mouths. One of its outlets to the sea is the Toe River, passing near the town of Maubin, while Pamput River is connected to the Toe River and runs almost parallel to the Maubin-Pyapon Road. The road crosses over several smaller drainage channels that are connected to Pamput River. There is no available discharge information for these rivers. Pamput River is also used for irrigation and water transport.

32. The Irrawaddy River has an average discharge of 13,000 cubic meter per second (m^3/s) with a range of 32,600 m^3/s to 2,300 m^3/s due to monsoonal rains, which occur between mid-May and mid-October. The volume of the Irrawaddy River and its tributaries varies greatly throughout the year. In summer, the melting of the snow and glaciers in Northern Myanmar add to the flow volume. It is navigable year round for nearly 1,600 km up to the junction with the Bhamo, the main tributary of the Chindwin River, largest tributary of the Irrawaddy River. The many streams of the Irrawaddy delta are navigable, and there is a regional system of inter-connecting canals.

33. *Climate*. Similar to other countries in South and Southeast Asia, Myanmar's climate follows a typical monsoon pattern. During half of the year, the land mass of Asia is heated by the sun more than the ocean. This draws moist hot air from over the ocean which moves to land, bringing the rains of the southwest monsoon season. The monsoon or rainy season, also called “the hot and wet season”, exists usually from May to October. In Myanmar during this hot and wet season, rain usually falls nearly every day and sometimes all day long. Its coastal regions are receiving over 5,000 millimeter (mm) of rain annually, while the southern delta region is approximately 2,500 mm.

34. The hottest period is between February and May, with little or no rain. At the end of this season, generally from March to April, the average monthly temperature reaches the upper 30°C in many parts of Myanmar. The average daily temperatures in Yangon range from 24° to 36°C in April, during the hot season. The dry and cooler weather is from October to February. The hot, dry inter-monsoonal season is from mid-February to mid-May. The country is less cloudy, with scant rainfall and mild temperatures and lower humidity during the winter. This is the time of the cool, relatively dry northeast monsoon. In this cooler season, the temperature for January averages 25°C in Yangon and Lower Myanmar with average daily temperatures in Yangon range from 18°C to 32°C in January. Lower Myanmar, especially in the river delta and along the coastal regions, is the most humid part of the country. The coastal and delta regions have a mean annual temperature of 32°C.

35. *Storms*. According to the natural hazards risk map of Myanmar (OCHA. 2011), the area is within a tropical storm intensity zone 1 (118–153 km/hour on the Saffir-Simpson Scale). This means that there is a 10% probability of a storm of this intensity striking in the next 10 years. On 2 and 3 May 2008, Nargis, a category 3 cyclone struck the Ayeyarwaddy Division and other areas of Myanmar. It caused large damage to the Ayeyarwaddy Delta with its wind speed of up to 200 km per hour and accompanied by heavy rains. It generated a storm surge of 3.6 m and caused widespread damage.

36. *Air Quality and Noise*. There are no available air quality data of the areas along the Maubin-Pyapon Road. Due to the rural and agricultural setting of the project area, there are no major sources of anthropogenic emissions. Both sides of the road corridor are occupied by farmlands, except for the residential/commercial area in Kyiaklat. It is therefore expected that the average ground level concentrations of sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and particulate matter (PM_{10}) will not exceed the values in the International Finance Corporation’s (IFC) guidelines (Environmental, Health, and Safety [EHS] Guidelines of April 2007) which are 20 micrograms per normal cubic meter (ug/Ncm), 40 ug/Ncm, and 20 ug/Ncm, respectively.

37. Similarly, there are no actual data on the present noise levels of the Maubin-Pyapon Road. Due to the rural setting of the road corridor, expected noise sources adding to the rural background would be the few vehicles using the road. It is therefore expected that present noise levels along the inhabited areas will not exceed the values in IFC's guidelines (EHS Guidelines of April 2007) which are 55 dB(A) for daytime and 45 dB(A) for nighttime.

B. Ecological Resources

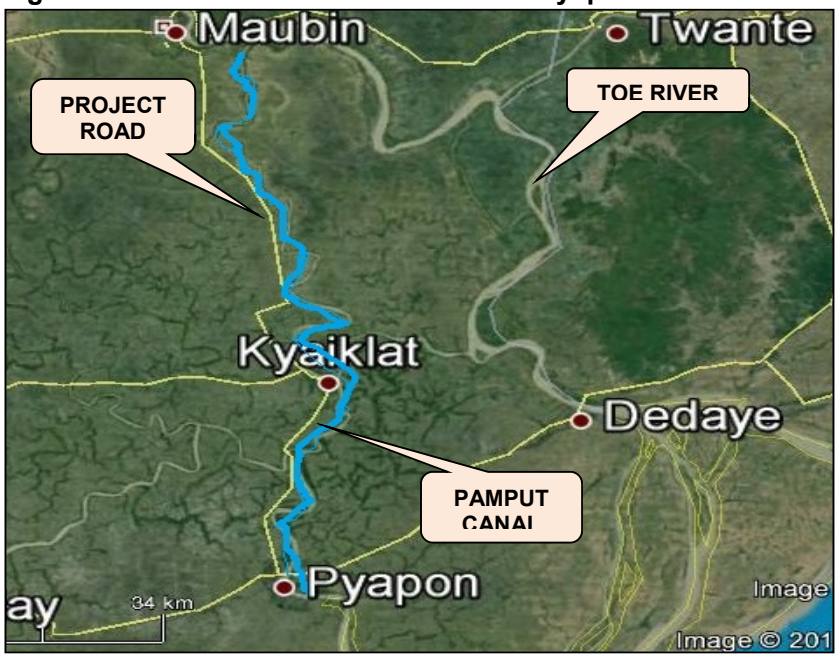
38. The present ecological setting of the area traversed by the Maubin-Pyapon Road is an agricultural landscape dominated by rice paddies. The rice paddies occupy most of the area immediately adjacent to the road and further beyond. Bamboo, banana plants, coconut trees, and other occasional fruit trees are also present. Roadsides are sparsely planted with Acacia (*Acacia auriculiformis*) and rain tree. Beyond the road corridors are basically cultivated strips of land dominated by rice paddies. The entire road corridor is not within or adjacent to a protected area or a mangrove area.

39. The entire length of the Maubin-Pyapon Road runs almost parallel to Pamput River which has an average width of 150 m. Pamput River branched-out from the Toe River, one of the outlets of the Ayeyarwaddy River. Hence, Pamput River is neither a primary nor a secondary stream. Pamput River is used for water transport, irrigation, and fishing. It is within this context that the ecology of Pamput River has been viewed. As reported by the 2011 National Biodiversity Strategy and Action Plan of Myanmar, freshwater ecosystems in Myanmar support the livelihoods of significant proportion of the human population. As a result, they are frequently subjected to high levels of human use, often with negative implications for biodiversity. Important habitats in these ecosystems have been extensively lost throughout the rest of mainland South-East Asia. This situation is true to Pamput River since the Maubin-Pyapon area has a high population density. Interview of local people revealed that Pamput River have some aquatic species that included, tilapia (*Oreochromis* spp.), catfish, and shrimps. Tilapia is a known invasive fish species. There is no available information of any migratory fish species in Pamput River. The Oo Yin Chaung Creek, which is crossed by the Oo Yin Chaung Bridge, is connected to Pamput Canal. The Irrawaddy Dolphin (*Orcaella brevirostris*), a threatened species, which is known to inhabit the coastal areas of Myanmar (National Biodiversity Strategy and Action Plan of Myanmar) has not been sighted in Pamput Canal according to the local people. The coastal area is some 40 km away from the project road.

40. An important fact to consider for this project is that the Maubin-Pyapon Road is not within an undisturbed landscape. This road has been functional for 19 years since it was first constructed in 1993. Hence, over the years the ecological changes due to human activities in the area resulted to the present agricultural landscape. Maubin, Pyapon, and Kyiaklat are essentially human settlement areas. Beyond the town centers, houses are sparsely lined along the road in a number of areas. Presence of human settlement areas and other commercial developments indicate a long period of human activities in these areas. A satellite photograph of the site and its surrounding areas is presented in Figure 4.1.

41. Devoid of forested areas, the road corridor and its immediate environs are unlikely habitats for large wild animals. It is also not a likely habitat for rare or endangered species. Farm and domesticated animals are therefore the large faunal species such as cows (*Bos indicus*), water buffaloes (*Bubals bubals*), horses (*Equus caballus*), goats (*Capra hircus*), pigs (*Sus domesticus*), chicken (*Gallus gallus*), ducks *(Anas platyrbynchos)*, goose *(Anser cygnoides)*, turkey *(Meleagris gallopavo)*, house cats, and dogs. Photographs of the site are presented Appendix 2.

Figure 4.1: Satellite Photo of the Maubin-Pyapon Road Corridor



Source: Google Earth. 2013

C. Economic Development

42. *Economy.* The three towns of the Maubin-Pyapon Road, that is Maubin, Kyiaklat, and Pyapon are all located in the Ayeyarwaddy Division of the Ayeyarwaddy Delta consisting of interminable and fertile plain in the southern part of Myanmar. The largest economic contributors to the delta are the same as in the economic pattern of the country as a whole. Agriculture, forestry, and fishing together constitute the largest contributor to Myanmar's economy. About half of all agricultural land in Myanmar is devoted to rice, and to increase production the government has promoted multiple cropping (sequential cultivation of two or more crops on a single piece of land in a single year), a system that is easily supported by the country's climate. As a whole, the sector accounts for nearly one-half of the country's gross domestic product and employs about two-thirds of the labor force.

43. Rice production of the Irrawaddy River delta now provides much of the country's export earnings. In the Ayeyarwaddy Division, the principal crop is rice giving it the name as the "rice granary of Myanmar". In addition to rice, other crops include maize, sesame, groundnut, sunflower, beans, and jute. In 2008, Kyiaklat was reported to be the largest summer rice producer in Myanmar with 118,700 acres planted with rice. Fishery is also important and the region produces fish, prawn, fish-paste, dry fish, dry prawn, and fish sauce.

44. In general, the agricultural sector has great potential to combat poverty and food insecurity. However, its development is hampered by major constraints including insufficient rural physical infrastructure such as roads. Improvement of the Maubin-Pyapon Road is therefore expected to contribute to the improvement of the economy of the area.

45. *Land Use*. Land use of the corridor along the Maubin-Pyapon Road follows the pattern in the Ayeyarwaddy delta's land use since Maubin and Pyapon are two of the major towns of the delta. The delta is one of the most densely populated parts of Myanmar and virtually all land not designated as reserved forest have been converted to intensive agriculture. The predominant form of cultivation is rice cropping during the wet monsoon and

accounts for two-thirds of the total area under cultivation. The delta has a history of intensive agriculture along its river banks.

46. Based on regional maps, the greater area where the project site is located in basically crop land. This information is consistent with the ocular inspection of the sites and the 2012 land cover map prepared by Myanmar Information Management Unit (MIMU). MIMU's land cover map indicated an alternating land use of cultivated lands (rice paddies) and idle lands (dominated by shrubs and grasses) from Maubin to Kyiaklat and south to Pyapon. However, interviews with the local people revealed that all the lands along the road corridor are now occupied by rice paddies. There are no reserved forests along or in the vicinity of the project road. Typical land use along the road corridor is shown in Photograph No. 3 of the appendices. In 2009, Kyiaklat had 136,400 acres of rice paddies. Other than the Kyiaklat section, the project road runs through farm lands. In Kyiaklat, the project road cuts through a residential area with presence of some commercial establishments from km 33+000 to km 35+370. There are no hospitals and schools within the ROW or near this road section. The location of places of worships or pagodas along the road are indicated in Figure 4.2. These are the Standing Buddha Pagoda (at km 35+241, about 20 m from the edge of the road) and the Kamphonep-wint Pagoda (at km 35+740, about 75 m from the edge of the road).

Figure 4.2: Kyiaklat Land Use along the Project Road

47. *Transportation, Communication, and Power*. The project area is accessible by land and water transportation and directly served by the Maubin-Pyapon Road. This road links Kyiaklat to both Maubin and Pyapon. Both ends of this road are linked to roads going to Yangon. Public utility vehicles ply the route from Pyapon to Maubin. Presently, more than 25% of the daily traffic volume are public utility vehicles. Water transportation is through the Pamput River which runs almost parallel to the Maubin-Pyapon Road. Cell phones are operational in these towns with a government-operated telecommunications company. The Myanmar Electric Power Enterprise supplies the electric power requirement of the project area with power supply from the national grid.

D. Social and Cultural Resources

48. *Population*. The three towns of Maubin-Pyapon Road have a combined population of 859,870 as reported in the population map prepared by MIMU in 2011. Maubin has the most population, followed by Pyapon, and Kyiaklat (Table 4.1). Most (87%) are considered rural population, while only 13% are urban. The three towns have the same population densities

of 200 to 364 persons per square kilometer, the highest density range in the Ayeyarwaddy Division.

Table 4.1: Project Towns Population in 2011

Project Town	Total Population	% of Total	Urban	Rural
Maubin	343,472	40	43,680	299,792
Kyiaklat	204,399	24	21,279	183,120
Pyapon	311,999	36	49,472	262,527
Total	**859,870**		**114,431**	**745,439**

Source: Population and Population Density Map of Ayeyarwaddy Region - 2011. (MIMU. 2012).

49. *Public Health*. Maubin has one hospital, a 200-bed facility, and several small clinics. Pyapon has a 200-bed hospital. People in Kyiaklat prefer the hospital in Maubin since they can quickly go to Yangon when the situation demands.

50. *Education*. Maubin is an educational center in this part of the delta. It has several educational centers including the Maubin Computer University, Maubin Technological University, and Maubin University. Maubin Computer University offers degrees in Bachelor of Computer Science, Bachelor of Computer Technology, Master of Computer Science, Master of Computer Technology, Master of Information Science and a Diploma in Computer Science. Pyapon and Kyiaklat do not have universities.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

51. Since the Project is considered environment category B, significant negative environmental impacts are not anticipated. A comprehensive screening for environmental impacts was made through a review of the scope of proposed rehabilitation works against the existing environmental conditions of the road corridor. A screening checklist was developed to help identify aspects that do not require further attention.

52. The assessment is made on the following phases of the project: (i) pre-construction; (ii) construction; and (iii) operation and maintenance. Results of the environmental impacts screening are summarized in Table 5.1, while the discussions of each issue are presented in the succeeding sections. In Table 5.1, impact types and magnitudes are indicated for both impacts without the mitigating measures and the resulting situations when mitigating measures will be implemented. The screening table uses the symbols "+" for positive impacts and "**−** "for negative impacts. Symbols for impact magnitudes are "∆" for small and "●" for moderate. The symbol for a small negative impact is "∆ **−"**, while a moderate negative impact is "● **−**". The second column of the table indicates the type and magnitudes of the impacts without any mitigating measures being applied. Some impacts have already small magnitudes even without mitigations and mitigating measures are therefore no longer required. The last column of the table indicates the expected impact magnitude after applying the mitigating measures. Hence, a moderate negative impact (● **−**) will become small (∆) after applying the mitigating measures. A summary of the environmental impacts and mitigation measures that should be carried out are detailed in the EMP at the end of this section as Table 5.2.

53. Environmental impacts arising from decommissioning of the rehabilitated Maubin-Pyapon Road were also reviewed but are no longer further discussed due to the following: (i) decommissioning of the road is a remote possibility since it has been serving for the past 19 years several towns in the southern and southwestern part of the delta and connecting them to the north through Maubin, and ultimately to Yangon. The road will further serve growing urban areas and it is critical for sustaining those areas and (ii) solid wastes from decommissioning is also not a major concern since the road are earth materials, while the base coarse and pavement are recyclable materials.

Table 5.1: Summary of Environmental Impacts Screening for Maubin-Pyapon Road

Environmental Impacts and Risks	Without Mitigation	With Mitigation
PRE-CONSTRUCTION PHASE		
Climate change vulnerability	● −	∆
Alteration of surface hydrology	n/a	n/a
Encroachment to environmentally sensitive areas	n/a	n/a
Impacts and risks to biodiversity conservation	n/a	n/a
Loss of assets (involuntary resettlement concerns)	● −	∆
CONSTRUCTION PHASE		
Modification of construction site topography	∆ −	∆
Erosion due to river sand removal	∆ −	∆
Removal of Special Status Trees	n/a	n/a
Displacement of Rare or Endangered Species	n/a	n/a
Potential damage to archaeological and cultural assets	∆ −	∆
Soil erosion and sedimentation within and in the vicinity of construction sites	● −	∆
Noise and vibration from construction equipment	● −	∆
Local air pollution due to construction activities	● −	∆
Oil and other hazardous materials releases	● −	∆

Environmental Impacts and Risks	Without Mitigation	With Mitigation
Bridge construction drilling wastes releases	● −	Δ
Vehicular traffic congestion and public access	● −	Δ
Hazards to public due to construction activities	● −	Δ
Pollution and health risk due to workers camp	● −	Δ
Occupational health and safety at work sites	● −	Δ
Increase employment opportunity in work sites	● +	● +
Improper closure of construction sites	● −	Δ
OPERATION AND MAINTENANCE PHASE		
Waterlogging and soil erosion due to clogged and inadequate drainage facilities	● −	Δ
Increased risk of road accidents	● −	Δ
Increased risk of water pollution on waterways	● −	Δ
Increased noise levels due to increase vehicular traffic	Δ −	Δ
Increased air pollution due to increase vehicular traffic	Δ −	Δ
Improved accessibility	● +	● +

n/a = not applicable; Δ = small; ● = moderate; + = positive; - = negative

A. Design/Pre-Construction Phase Considerations

54. *Climate Change Vulnerability*. Climate change resilience of the existing Maubin-Pyapon Road was demonstrated last May 2008 when a large flood rampaged through the Ayeyarwaddy delta due to Nargis, a strong cyclone. According to the local people, the road was above the flood water levels even if the area was severely flooded at that time.

55. Mitigation. The 2008 flood level will become the basis for climate change adaptation considerations of the Maubin-Pyapon Road rehabilitation since based on the natural hazard risk map of Myanmar (OCHA. 2011), the area is only within a tropical storm intensity zone 1 (118–153 km per hour on the Saffir-Simpson Scale). A category 1 cyclone will have a 10% probability of striking in the next 10 years. However, Nargis, a category 3 cyclone struck the Ayeyarwaddy Delta on May 2008 with its wind speed of up to 200 km per hour and accompanied by heavy rains. Consequently, for climate change adaptation, road height will be increased to avoid submerging the road in future large floods. In general, the road will be raised by 0.3 m to 0.4 m.

56. *Alteration of Surface Hydrology*. For any road, particularly in a low land area, one of the potential environmental issues is the alteration of surface hydrology, including blocking of surface flows by the road. This type of impact is not present in this project since the surface hydrology of the general area where the project is located is mainly controlled by the presence of rice paddies and the system of canals. In addition, the road is relatively close to a small stream (Pamput Rive) running almost parallel to it. All streams/canals connected to Pamput River and crossed by the road are provided with permanent bridges for the larger ones, while the smaller ones are provided with culverts.

57. Initial discussions with the people in the area revealed that there were no flooding instances in the past that can be attributed to the presence of the road. The road was not flooded even during a large flood rampaging through the Ayeyarwaddy delta in 2008 even if the area was severely flooded at that time.

58. *Encroachments to Environmentally Sensitive Areas*. There will be no encroachments to environmentally sensitive areas. The existing road is located in a corridor that has been transformed already into its present agricultural landscape dominated by rice paddies, grasses, shrubs, and few planted trees. The road corridor is not within undisturbed

landscapes. It is also not a mangrove area. It is not within or near environmentally protected areas.

59. *Impacts and risks to biodiversity conservation*. The issue of impacts and risks to biodiversity conservation is not applicable to this project since the road is not located in areas that have concerns on biodiversity conservation. The areas parallel to the road are not undisturbed and over the years the ecological changes due to human activities in those areas have resulted to its present agricultural landscapes.

60. *Loss of Assets and Involuntary Resettlement*. Inventory of losses and identification of involuntary resettlement issues for the Maubin-Pyapon Road Rehabilitation Project were made during technical assistance (TA) implementation. In compliance with ADB's SPS, a separate involuntary resettlement plan for: (i) those people to be physically displaced or resettled, (ii) those affected people with loss of assets, (iii) the removal of trees along the roadsides that were planted by the Forestry Department of the MOECF, and (iv) removal and restoration of affected public utilities, such as power and communication lines. The contractor will closely coordinate with the responsible agency for power and telecommunications for the affected poles and cables in order that removal and restoration of the affected facilities will not unnecessarily affect the public and obstruct the progress of construction.

61. *Disruption of utilities and/or services*. Site preparation may necessitate removal or relocation of utilities. To minimize disruption of services to communities, the following measures will be observed by the contractors: (i) water supply pipelines, power supply, communication lines, irrigation facilities and other utilities that will be affected by construction will be re-provisioned (lay-out of new lines) before construction works commence so that interruption of services will be at the minimum, (ii) provisions will be made to preserve the operation of current facilities in sufficient quantity and in agreement with the local community, (iii) re-provisioning will be undertaken in coordination with the utility company and local authorities, (iv) affected households and establishments will be notified well in advance of such disruption, and (v) replacement structures (e.g., irrigation canals) will be constructed prior to the demolition/removal of the existing structure.

62. *Improper disposal of excavation spoils*. Damage to the environment will most likely arise if suitable disposal sites for excavated soil and removed pavement are not identified prior to commencement of site works. The contractor may resort to fly tipping or indiscriminate dumping of spoils that could pollute water courses and damage productive land. To avoid such impacts, before excavation and removal of pavement commence, the environmental specialist of the CSC/Engineer and MOC/PW undertake inspection and approval of the contractors' disposal sites to ensure that the EMP criteria for such sites are met.

B. Construction Phase Environmental Impacts

63. *Potential Damage to Archaeological and Cultural Assets*. At present, there are no information of any archaeological and cultural assets that may be affected by the rehabilitation activities of the road. Local people, who initially constructed the road, claimed that during the original construction of the road, no archaeological and cultural assets were discovered.

64. Proposed construction activities for road rehabilitation will be limited to pavement replacement and embankment widening. These activities will not require extensive excavations since the present road is in a relatively flat terrain. In addition, there will be no soil quarrying activities in the area since local soil is unsuitable as fill materials. Construction materials will be imported from other places which the contractors will later determine. It is

therefore unlikely that archaeological assets will be encountered due to excavations. Since the road alignment will be maintained, cultural assets are not expected to be affected.

65. Nevertheless, precautions will be taken to avoid potential damage to any archaeological and cultural assets (that may be found by chance) by inclusion of EMP provisions in tender and construction documents requiring the contractors to immediately stop excavation activities and promptly inform the local authorities and the Department of Archaeology of the Ministry of Culture if archaeological and cultural assets are discovered.

66. *Modification of Construction Site Topography*. Rehabilitation works of the Maubin-Pyapon Road will not involve significant modification of the construction site topography since it is an existing road and road height increase will be small. Road widening will be within the ROW. The existing road has followed the corridor's relief as closely as possible. It is not out of character with the terrain in height, length, and inclined slopes. This issue is therefore considered not significant.

67. *River Erosion due to River Sand Removal.* As discussed in para. 23, sand will purchased by the contractors from commercial sources. The contractors or their subcontractors will not be setting up sand extraction facilities specifically for the project. Hence, specific locations for sand extraction in the Ayeyarwaddy River (the likely source to be used by commercial operators) are not yet known at this stage. However, the project will observe environmentally responsible procurement by requiring the contractors to source sand only from commercial operators with the necessary environmental approvals from MOECF. The estimated volume of sand for use in the road embankment is 140,000 m^3. Sand extraction may cause changes in river morphology. However, it is expected to be minimal in the case of the Ayeyarwaddy River due to its high annual sediment load. The Ayeyarwaddy River (also known as Irrawaddy River) has the third largest sediment load at about 364 MT (±60 MT) in the world after the Amazon and Ganges-Brahmaputra Rivers[3]. This high annual sediment load will allow sand extraction with minimal impact to river morphology. In fact it is known that rivers can accommodate the removal of some portion of their bedload without creating adverse environmental impacts provided that the mining activities are kept within the hydraulic limits set by the natural system[4]. Sand extraction may also cause disturbance to benthic aquatic life. However, since the Ayeyarwaddy River has been a source for sand for several years and with the constant movement of sediments due to its high annual sediment load, it is therefore presumed that the benthic ecology has already adapted to these disturbances.

68. *Removal of special status trees*. Removal of special status trees (rare, endangered, threatened, or with historical value) will not be an issue since trees that will be affected by the widening are common species sparsely planted along the roadside consisting mostly of ornamental trees such as Acacia (*Acacia auriculiformis*) and rain tree. According the Forestry Department, their office started planting roadside trees along the project road between 1995 to 1996. However, for the Kyiaklat to Pyapon sections, most of the existing trees were planted in 2009 to replace trees that were felled by typhoon Nargis in 2008.

69. Based on the Resettlement Plan, the estimated number of trees that will need to be cut for the road rehabilitation works are as follows: 684 trees in the Maubin District section and 3,047 trees in the Pyapon District section (includes Kyiaklat and Pyapon townships).

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[3] Source: R. Robinson and others. 2007. The Irrawaddy River Sediment Flux to the Indian Ocean: The Original Nineteenth-Century Data Revisited. Journal of Geology, 2007, volume 115, p. 629–640]. The University of Chicago.

[4] Source: W. Langer. A General Overview of the Technology of In-Stream Mining of Sand and Gravel Resources, Associated Potential Environmental Impacts, and Methods to Control Potential Impacts. 2003.

The dominant species planted along the roadside are acacia, banana, eucalyptus, rain tree and teak (in descending order). The exact number of trees to be removed will be determined by the final road alignment. The Resettlement Plan also addresses the removal of roadside trees owned by local people as well as corresponding compensation (either in the form of assistance for balling and replanting the trees or in cash). MOECF's Forestry Department has been undertaking annual replanting of trees (mainly acacia) along the project road for landscaping/greening purposes, to provide shade and to provide sources of firewood for the local communities.[5] The sparsely planted trees mostly have a diameter at breast height (dbh) of less than 0.6 m. According to MOECF,[6] MOC will only need to secure tree cutting permit for trees with dbh of at least 0.6 m. MOC will need to replace all cut trees planted by the Forestry Department upon completion of construction in compliance with MOECF requirements. Removal of roadside trees will be carried out by MOC. Cut trees with dbh of at least 0.6 m will be turned over by MOC to MOECF. Disposal of cut trees with dbh of less than 0.6 m will be decided on by the District General Administration Department in consultation with the District Construction Department. The contractors will implement the following measures: (i) prohibit cutting of trees for firewood and use in the Project, and (ii) ensure that tree cutting is limited to areas that are only necessary based on the Project design and as approved by the MOECF.

70. *Displacement of Rare or Endangered Species*. The issue on displacement of rare or endangered species is not applicable for the Maubin-Pyapon Road since there are no known rare or endangered species for both terrestrial and aquatic species within the road corridor. The road is not within or near an environmentally protected area. It has been functional for 19 years already since it was first constructed in 1993. It is therefore not a risk to biodiversity conservation.

71. *Potential Damage to Archaeological and Cultural Assets*. At present, there is no information of any archaeological and cultural assets that may be affected by the construction activities at the road. Local people, who constructed the road initially, claimed that during the original construction of the road, no archaeological and cultural assets were discovered. The potential to damage archaeological and cultural assets that lay undiscovered below the ground is low since there will be no deep excavations associated with rehabilitation works. Although at present there is no information of any archaeological and cultural assets that may be affected by the rehabilitation works, this potential impact requires precautionary measures.

72. Mitigation. An effective approach to avoid potential damage to any archaeological and cultural assets during the construction phase is the inclusion of EMP provisions in construction documents requiring the contractors to immediately stop excavation activities and promptly inform the local authorities and the Department of Archaeology of the Ministry of Culture if archaeological and cultural assets are discovered.

73. *Soil Erosion and Sedimentation within and in the vicinity Construction Sites*. During rainy periods, exposed soil at the construction sites can easily be washed away by runoff and carried to the natural drainage system. Widening the embankments of the Maubin-Pyapon Road is a potential source of sediments and can easily release soil materials to the surrounding areas if not provided with sediment control. Soil materials from embankment sections which are not yet stabilized (compacted to specifications) can easily be carried by runoff to the natural drainage system or to farmlands adjacent to the road during rainy periods.

[5] Meeting between District Forestry Departments of Maubin and Pyapon; Township Engineering Offices of Maubin, Kyiaklat, and Pyapon; and ADB on 25 February 2014.
[6] Meeting between MOC, MOECF and ADB on 28 February 2014.

74. Quarries and borrow pits are also specific sources of sediments. Without mitigation, operations of quarries and borrow pits could be messy and has the potential to release sediments to the surrounding areas and causing significant negative environmental impacts. Potential location of quarries and borrow pits are expected to be far from the corridor of the Maubin-Pyapon Road due to the poor quality of the site's soil materials.

75. Mitigation. Control of surface runoff from the road construction sites is necessary in preventing erosion. The contractor will be required to use structural erosion prevention and sediment control measures which will divert the storm water flows away from the exposed areas, prevent sediments from moving offsite, and reduce the erosive forces of runoff waters. These may include the use of the following, as appropriate for site conditions: (i) small interceptor dikes, (ii) pipe slope drains, (iii) grass bale barriers, (iv) silt fence, (v) sediment traps, and (vi) temporary sediment basins. Whenever possible, total exposed area will be minimized.

76. During construction of road embankments, the following will be required in order to control erosion: (i) construction of all required permanent erosion control features as soon as practical, such as riprap and protection of turnouts or tail ditches, and (ii) provision of devices to slow down the water, such as use of erosion control blankets or any appropriate devices, for sections not yet stabilized (compacted to specifications). In road sections near canals and streams, silt fences will be provided, to prevent sediments from moving off-site and causing excessive turbidity in waterways and to minimize impacts on the aquatic biota. The contractor will also implement the following: (i) suitable soil erosion control measures will be implemented prior to excavation for bridge works, and (ii) silted water carried with the spoils during excavation and bridge works will be properly treated (e.g., through settling ponds) to prevent sediment-laden water from draining directly back into the waterway.

77. For quarries and borrow pits, the contractor will provide sufficient information regarding the quarries and borrow pits, including commercial sources, that he will use for the project and the associated environmental mitigation measures to be instituted in those locations. The information will include locations, scale of operations, method of transport of materials, and schedule of use relative to the overall construction schedule. The following will be required for quarries and borrow pits: (i) only licensed quarries will be used or the contractor will obtain its own licenses (ii) borrow pits will be covered by required government permits or approvals, (iii) will not be located within 300 m of any urban area sensitive receptors, and 1 km from protected areas, (iv) topsoil will be saved for rehabilitation during closure of the quarries and borrow pits, and (v) will be provided with drainage and sediment flow controls. Upon completion of extraction activities, quarries and borrow pits will be dewatered, fences and warning signs will be installed, as appropriate to avoid impacts to public health and safety. Borrow pits and quarries will be left in a tidy state with stable side slopes and proper drainage

78. *Construction Noise and Vibration*. Trucks and construction equipment, which can generate noise of 80 dB(A) from a distance of 30 m are the potential sources of noise during construction of the Maubin-Pyapon Road. The issue is mostly applicable in Kyiaklat where the road runs through a built-up area with establishments and houses. It is also applicable at the road starting point in Maubin and road end point in Pyapon. Both points are near some houses. Significant vibration from construction activities are not expected in road rehabilitation works. In fact, 20 m beyond a vibration source, vibration will be below levels of human perception due to attenuation in the soil as found in a study for roads (Martin. 1977).

79. Mitigation. Nuisance from equipment noise can be mitigated with the use of sound suppression devices for the equipment. In areas near houses or noise-sensitive sites, noisy equipment will not be operated during nighttime to early morning (19:00H – 06:00H). Noise levels due to construction activities should not exceed 55 dB(A) near residential areas during

daytime and 45 dB(A) for nighttime based on World Health Organization recommendations. Temporary noise barriers will be used in areas determined by the CSC. Workers using noisy equipment will be provided with ear plugs. The contractors will also provide prior notification to the community on schedule of construction activities. Whenever possible, completely enclose noisy equipment which can significantly reduce noise levels. Position any stationary equipment that produce high noise levels (e.g., portable diesel generators, compressors, etc.) as far as is practical from sensitive receptors. Construction traffic routes will be defined in cooperation with local communities and traffic police to minimize noise and nuisance.

80. *Local Air Pollution Due to Construction Activities*. During dry periods, dust generation can be expected from activities associated with the rehabilitation of the Maubin-Pyapon Road such as removal of old pavement and preparation of the new pavement. Intermittent episodes of localized air pollution from smoke emitting equipment may also occur. Other potential sources of air pollution are large stockpiles of construction materials such as soil and aggregates, asphalt batching plants, concrete batching plants. Without any mitigating measures, dust generation could be problematic during dry periods and during operation of plant facilities.

81. Mitigation. Prior to establishment of construction-related facilities such as asphalt batching plants, casting yard, laydown/storage sites, concrete batch plants, crushing plants, quarries, equipment maintenance yards, etc., the contractor will secure necessary environmental approvals and permits as well as other required agreements prior to establishment and operation of construction related facilities. The contractor will also ensure that facilities that will result to emission of high dust and/or elevated noise levels such as asphalt batching plants, concrete batching plants and the like will be located at least 300 m from sensitive receptors (residential/housing areas, schools, medical facilities, places of worship, cultural sites, etc.).

82. The contractor will be required to perform regular water spraying of the sites during dusty periods in order to reduce the generation of dusts. The contractor will also be required to use equipment that are properly maintained and are not smoke emitting. Covers for stockpiles of soil and aggregates that will be left idle for a long time will be required. Covers will prevent dust generation due to wind action. Trucks transporting loose construction materials such as sand, gravel, spoils, and the like will be provided with tarpaulin cover. Vehicle speed will be controlled at unpaved road section so as not to cause excessive dust generation. Open burning of waste and materials will be prohibited. Regularly clean roads to remove tracked in mud, cement, etc. from construction works. Stockpiling of spoils near sensitive receptors will be prohibited. Areas within the project where there is a regular movement of vehicles will have an acceptable hard surface and be kept clear of loose surface material. Cement and other such fine-grained materials delivered in bulk will be stored in closed containers. Wheel washers will be provided in active construction sites so that haul/delivery trucks can be cleaned of mud and dirt as they exit the work area.

83. *Oil and other hazardous materials releases*. Presence of oil products and other hazardous materials are expected in the rehabilitation of the Maubin-Pyapon Road. These include bitumen, fuel, oil, grease, paints, and solvents. These materials are associated with operation of the construction heavy equipment and vehicles and various construction activities. Bitumen will be transported by trucks. Some of these materials may accidentally be released to the environment. Accidental releases to the waterways will affect water quality and aquatic biota. In some cases, even small quantities of hazardous materials can be lethal to aquatic biota.

84. Mitigation. The contractors will be required to implement the following: (i) provide maintenance shops, fuel and oil depot with impermeable flooring with sump where wash water and sludge can be collected for proper disposal; (ii) refuelling and servicing of

equipment should only be carried out in specified areas adequately equipped to avoid leaks and spills that could contaminate soil and water resources; (iii) only minimal chemicals, hazardous substances and fuel will be stored on site, within an enclosed and covered secure area that has an impervious floor and impervious bund around it (with capacity at least 120% of the total capacity of the tank/s). The storage area will be located away from water-courses, flood-prone areas, work camps, and danger areas; (iv) oil stained refuse such as oily rags, spent oil filters, used oil should be collected and disposed of through recyclers/ authorized waste handlers and disposal in authorized waste facilities; (v) ensure availability of spill cleanup materials (e.g., absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored and used. If spills or leaks do occur, undertake immediate clean up; (vi) train relevant construction personnel in handling of fuels/hazardous substances and spill control procedures; (vii) ensure all storage containers are in good condition with proper labeling; (viii) regularly check containers for leakage and undertake necessary repair or replacement; (ix) store hazardous materials above flood level; (x) equipment maintenance areas and fuel storage areas will be provided with drainage leading to an oil-water separator that will be regularly skimmed of oil and maintained to ensure efficiency; (xi) discharge of oil contaminated water into the environment will be prohibited; (xii) store waste oil, used lubricant and other hazardous wastes in tightly sealed containers to avoid contamination of soil and water resources. Transport and off-site disposal of such wastes will comply with applicable laws and regulations; (xiii) restoration of temporary work sites will include removal and treatment or proper disposal of oil contaminated soils.

85. For the bitumen transport, the contractor will ensure that the hauler and supplier will guarantee that the trucks to be used for transport are approved by local authorities for the transport of bitumen and are also in accordance with the supplier's instructions for transport. In addition, the truck driver must be familiar with the safe loading and unloading procedures of the bitumen products, including the emergency procedure during spillage. Trucks will be provided with tools and materials for handling spills. In case of a small spill during transport, allow the bitumen to cool and solidify in order to be removed mechanically into containers for disposal. For large spills, prevent from spreading by making a trench or barrier with sand, soil or other materials. To be removed mechanically into containers for disposal.

86. *Bridge construction drilling wastes releases*. Upgrading of the Oo Yin Chaung bridge and Kyee Chaung Bridge from single lane steel bridges to 2-lane concrete bridges will require enlargement of abutment and abutment foundations. This might involve drilling activities for any additional piling works. Use of bentonite materials for this activities requires mitigations to avoid water quality impacts on the rivers/creeks.

87. Mitigation. Bentonite slurry, bentonite sludge, mud and other materials and wastes from drilling will be collected and processed to avoid pollution of surface water. Discharge of such materials into watercourses will be prohibited. Drilling solutions will be processed in a closed system. Spillage of bentonite mud in surrounding areas and agricultural land will be cleaned immediately to prevent caking and hardening.

88. *Vehicular Traffic Congestion and Public Access*. Rehabilitation activities of the Maubin-Pyapon Road may cause traffic congestion at Kyiaklat and at both starting point (at Maubin) and end point (at Pyapon) of the road since the road is presently used for land transport between Maubin and Pyapon including the towns beyond Pyapon. Only 23% of the present vehicular traffic represents motorcycles, while majority (77%) are vehicles with 4 wheels and above. Some 470 vehicles are using the road every day at present. Although this is a modest number, any temporary road closure will surely lead to traffic congestion in the area and may hinder public access.

89. Transport of construction materials and the maneuvering on the road by delivery trucks and equipment may also lead to traffic congestion and may hinder public access since vehicles would still be using the road while construction activities are ongoing.

90. Mitigation. Contractors will be required to: (i) prepare a traffic plan and provide traffic management personnel to direct the flow of traffic, (ii) closely coordinate with local authorities for any closure of roads or rerouting of vehicular traffic, if required, and (iii) ensure access in areas to be closed temporarily by provision of temporary bypass road and (iv) provide signs to direct motorists and pedestrians to access areas, and (v) consider the schedules of local activities with heavy presence of people such as festivities, processions, parades, etc. in the timing of construction activities.

91. *Hazards to public due to construction activities*. Presence of hazards to the public associated with rehabilitation activities of the Maubin-Pyapon Road is expected. Hazardous driving conditions may be created in road construction activities since vehicles would still be using the road while construction activities are ongoing. The movement of construction vehicles and various activities would pose some hazards to the driving public.

92. Mitigation. The contractor will be required to implement a road safety plan incorporated in his proposed construction methodology and schedule. Safety measures will be implemented including: (i) warning signs to alert people of hazards around the construction sites, (ii) barricades, and (iii) night lamps for open excavations, (iv) lighting system to illuminate nighttime operations, and (v) provision of traffic management staff to direct the flow of traffic. These measures will be included in the EMP which will be part of the construction contract specifications.

93. *Pollution and Health Risk due to Workers Camp*. The contractor is expected to erect temporary workers' camps during rehabilitation activities of the Maubin-Pyapon Road. Improperly managed silt runoff and sanitary wastes from these camps may reach nearby areas and will affect water quality of streams and aquatic biota. Poor sanitation and lack of proper solid waste management at the worker's camp will provide the conditions for vermin and other disease vectors to easily multiply and infect the workers. This may lead to the transmission of diseases from the workers camp to other areas. These conditions will increase public health risk.

94. Mitigation. The construction contractor will be required to: (i) install proper sanitary facilities to prevent the indiscriminate discharge of sanitary wastes at the camps' surroundings, (ii) implement proper solid waste management, and (iii) prevent surface runoffs from flowing into the workers camps to avoid carrying away any contaminants. The contractor will be required to use temporary diversion drains, catch drains, and silt-traps at these camps.

95. *Occupational Health and Safety at Work Sites*. Construction hazards are expected in the rehabilitation of the Maubin-Pyapon Road. Hazards may exist in all construction sites in many different forms such as sharp edges, falling objects, flying sparks, chemicals, noise and various potentially dangerous situations. Good practices in construction occupational health and safety requires that employers protect their employees from workplace hazards that can cause injury.

96. Mitigation. Contractors will be required to address the issue on occupational health and safety at the construction sites by: (i) implementing a construction site health and safety management plan, (ii) ensuring that an equipped first aid station is available at all times, (iii) providing the workers with potable water and adequate sanitation facilities, (iv) providing the workers with clean eating areas, (v) providing the workers with personal protective equipment (PPE) to minimize exposure to a variety of hazards, and (vi) providing fire-fighting

equipment and fire extinguishers in workshops, fuel storage facilities, construction camps, and any sites where fire hazard and risk are present .

97. The construction site health and safety management plan (CSHSMP) will provide guidance to the contractors' staff on how good work practices can be carried out on every activity in the construction site to prevent accidents to the workers and the general public. This will include, among others, emergency procedures and the required resources, clear description of responsibilities and management, specific requirements of occupational health and safety policies and regulations, training requirements, and site safety rules. The contractor will prepare its CSHSMP during preparation of its CEMP.

98. Establishing and maintaining a safe and healthful work environment requires responsibilities from both the contractors and their workers. In general, contractors are responsible for: (i) performing a "hazard assessment" of the workplace to identify and control physical and health hazards, (ii) identifying and providing appropriate PPE for employees, (iii) training employees in the use and care of the PPE, (iv) maintaining PPE, including replacing worn or damaged PPE, (v) periodically reviewing, updating and evaluating the effectiveness of the PPE program. Workers should: (a) properly wear PPE (b) attend training sessions on PPE, (c) care for, clean and maintain PPE, and (d) inform a supervisor of the need to repair or replace a PPE. Workers should not be allowed to work without wearing the appropriate PPE.

99. *Increase Employment Opportunities at Work Sites*. Considerable number of workers will be required for the various construction activities of the Maubin-Pyapon Road rehabilitation. The impact would be beneficial and significant since employment opportunities in the area will increase for over three years, the estimated construction period.

100. Enhancement. Whenever possible, the contractor will be required to use the available local labor for these construction activities. The recruitment of workers will be coordinated with the local officials in order to give preference to the local people.

101. *Improper Closure of Construction Sites*. Rehabilitation activities of the Maubin-Pyapon Road are expected to generate construction solid wastes during construction and after completion of work. This may include used wood materials, steel works cuttings, paint and solvents containers, used oil from equipment, bentonite containing spoils, unused aggregates, etc. Construction of embankments may also generate some surplus earth materials. If not remove from the sites after completion of the construction activities, these solid wastes will cause aesthetic problems and some will be potential sources of contaminants for surface runoffs and causing water pollution of nearby water bodies.

102. Mitigation. After completion of work activities, the contractor will be required to remove the construction wastes from the sites before finally leaving them. The entire sites must be free of any construction solid wastes. Implement the required restoration of disturbed sites. It will be the contractor's responsibility to identify suitable sites for disposal of the surplus soil materials and bentonite containing spoils. The proposed disposal sites for soil/excavated materials and bentonite containing spoils will be inspected and approved by the CSC and Maubin and Pyapon PW to ensure that the following criteria are met: (i) disposal sites will be located at least 50 m from water courses such as rivers, streams, irrigation canals, drainage and the like; and (ii) disposal will not cause sedimentation and obstruction watercourses, damage to agricultural land, densely vegetated areas and properties. The contractor will also obtain any required agreements, approval or permits from local authorities and land owners. Prohibit dumping of wastes into watercourses, agricultural land and surrounding areas.

C. Operation Phase Environmental Impacts

103. *Waterlogging and Soil Erosion due to clogged and inadequate drainage facilities*. During the operation phase, drainage facilities of the road will regularly accumulate some sediments and debris. This will surely reduce their water conveying capacity and could lead to waterlogging and soil erosion. Eventually, it will cause the deterioration of the drainage facilities and further erosion of the surrounding environment. The situation will be aggravated if the drainage facilities have inadequate design capacities. However, this issue will not apply to most of the road sections since the road is on a relatively flat topography and resting on embankments where naturally storm runoffs can easily flow to the roadsides and disperse down to the embankment toe.

104. Mitigation. Road drainage facilities, such as culverts and drains, will be maintained regularly to maintain their design capacities. Removal of the accumulated sediments and debris must be done regularly. Discharge points to streams and tail ditches must be inspected regularly to ensure they are stable and not deteriorating due to scour. It is therefore necessary for MOC/PW to implement a road drainage maintenance program.

105. *Increased Risk of Road Accidents*. Risks of accidents, associated with increase vehicular traffic are normally influenced by the road features and its surroundings. In addition, pedestrians and non-motorized vehicles are at greater risk since they use the road together with the motorized traffic. Improving the Maubin-Pyapon road will normally increase the vehicular traffic and the travel speed of the vehicles. It is estimated that traffic volume will double within the next 10 years. It is therefore expected that the risks of accidents will slightly increase. For 2012–2013, data of MOC/PW indicated that the recorded number of injured people due to road accidents were 20 with one fatality.

106. Mitigation. Decreasing the risks of accidents associated with increased vehicular traffic would require a strong information and education campaign at the local level on the risks of accidents. The following measures may also help decrease the risks: (i) improvement of crossing sites such as providing the appropriate signs and markings, (ii) speed-limiting measures such as provision of speed limit signs and active police enforcement of speed limits in populated areas, such as the Kyiaklat section, and (iii) provision of adequate road shoulders. Implementation of the mitigating measures will reduce the expected impact to an insignificant level.

107. *Increased risk of water pollution on waterways*. Due to an improved road pavement, it is likely that road traffic at the Maubin-Pyapon Road will increase and estimated to double within the next 10 years. People from the towns further beyond Pyapon and those west of Kyiaklat will likely use the improved Maubin-Pyapon Road in going to Maubin and Yangon. With the increase traffic volume, it is therefore expected that the risk of water pollution from oil, grease, fuel spills, and other materials from vehicles using the road will also increase. This is particularly important on the waterways of the following culverts/bridges: (i) Kyar Ga Yet Yoe, (ii) Ngar Yit Sal, (iii) Kha Naung, (iv) Pa Kout Yoe, (v) Pa Kout Yoe, (vi) lat Tat Gyi Yoe, (vii) Mayan Yoe, (viii) Htein Pin Yoe, (ix) Lata Gyi, (x) Oo Yin Chaung, (xi) Kyee Chaung, (xii) Hlal Sate, (xiii) Kha Naung, (xiv) Gonhnyintan, (xv) Thaleik kyee, (xvi) Thaleik kalay, and (xvii) Chaung Twin.

108. Mitigation. MOC/PW, together with the local government of Maubin, Kyiaklat, and Pyapon, will prepare a spills response plan specific to the Maubin-Pyapon Road. It should contain, at least, procedures on: (i) how to stop the flow of spill, (ii) contain the spill to prevent from spreading including the storage of absorbent material for spills, (iii) cleanup of the spilled materials, and (iv) proper disposal of used spill cleanup materials. A list will be prepared of who are transporting hazardous materials and the quantities being transported along these routes. This will help estimate the magnitude of potential problems and design

an effective spills response plan. Presence of several waterways in the Maubin-Pyapon road corridor suggests the need for an effective spills response plan.

109. *Increased noise/vibration levels due to increased vehicular traffic*. Noise levels are not expected to increase significantly along the Maubin-Pyapon Road since the increase in traffic volume is expected to be only 1.6 times and 3.2 times of the 2013 value within the next 5 and 15 years, respectively. All expected sources of vehicular traffic were considered in the traffic volume forecasting. On the 5th year (2018) from 2013, the annual average daily traffic (AADT) is expected to be only 1,750 while the on the 15th year (2028), the AADT will only be 3,480. These AADT values will result to noise levels within the IFC's guidelines (EHS Guidelines of April 2007) of 55 dB(a) for daytime and 45 dB(A) for nighttime. The expected noise levels are presented in Table 5.2. The results are consistent with the low expected AADT values and the rural setting of the project road. Noise levels in roads are known not to increase significantly even if the traffic volume is doubled from its present volume.

Table 5.2: Predicted Road Noise Based on Annual Average Daily Traffic

	2013[a]	2018[b]	2028[c]	IFC Guidelines
Daytime noise, dB(A)	48	51	54	55
Nighttime noise, dB(A)	40	42	45	45
Year after 2013	-	5th	15th	

[a] AADT of 1,100 provided by PPTA Economist based on updated data.
[b] AADT of 1,750 provided by PPTA Economist based on high GDP growth for 2018.
[c] AADT of 3,480 provided by PPTA Economist based on medium GDP growth for 2028.

110. *Increased air pollution due to increase vehicular traffic*. Increased air pollution due to increased vehicular traffic at the Maubin-Pyapon Road is not expected to be significant since the flat rural setting of the general area where the road is located is a place where air dispersion can easily dilute the emissions from vehicles. The wide farms (rice paddies) along both sides of the road have large open air spaces where wind can easily develop and provide air dispersion. Increase in traffic volume is expected to only double within the next 10 years from a present daily value of 470 vehicles. This value is not sufficient to cause an alarming hourly increase in air emissions in any location. Assuming a 10-hr vehicle distribution, the vehicle volume on the 10th year would be 94 per hour or roughly 2 per minute. Even assuming a 15% peak hour traffic, the vehicle volume on the 10th year would be 141 for the peak hour or roughly 3 per minute for the peak hour.

111. *Improved Accessibility*. Rehabilitating the Maubin-Pyapon Road has significant positive impacts to the served communities. This route will become an all-weather transport link between two of the major urban centers of the southern Ayeyarwarddy delta. This will help provide the people with better access to markets and creates economic opportunities for them to sell their labor and products. The rehabilitated road will also facilitate the access of the people to universities and colleges in Maubin from those in Pyapon, Kyiaklat, and those towns beyond the road. It will also facilitate access to health services in Maubin and further to Yangon.

112. Mitigation. A road maintenance program will be implemented by the respective PW offices of Maubin and Pyapon in order to sustain the benefits derived from an improved road.

113. After screening, Table 5.3 lists the environmental impacts and risks that requires mitigation and will be carried to the EMP Section.

Table 5.3: Environmental Impacts and Risks for EMP of Maubin-Pyapon Road

Environmental Impacts and Risks	Without Mitigation	With Mitigation
PRE-CONSTRUCTION PHASE		
Climate change vulnerability (design aspect)	● −	Δ
Potential nuisance and problems to the public	● −	Δ
Loss of assets (involuntary resettlement concerns)	● −	Δ
CONSTRUCTION PHASE		
Potential damage to archaeological and cultural assets	Δ −	Δ
Soil erosion and sedimentation within and the vicinity of construction sites	● −	Δ
Noise and vibration from construction equipment	● −	Δ
Local air pollution due to construction activities	● −	Δ
Oil and other hazardous materials releases	● −	Δ
Bridge construction drilling wastes releases	● −	Δ
Vehicular traffic congestion and public access	● −	Δ
Hazards to public due to construction activities	● −	Δ
Pollution and health risk due to workers camp	● −	Δ
Occupational health and safety at work sites	● −	Δ
Increase employment opportunity in work sites	● +	● +
Improper closure of construction sites	● −	Δ
OPERATION AND MAINTENANCE PHASE		
Waterlogging and soil erosion due to clogged and inadequate drainage facilities	● −	Δ
Increased risk of road accidents	● −	Δ
Increased risk of water pollution on waterways	● −	Δ
Improved accessibility	● +	● +

Δ = small; ● = moderate; + = positive; - = negative

VI. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

114. Meaningful stakeholders' consultation and participation is required to ensure successful implementation of the Maubin-Pyapon Road Rehabilitation Project. Activities for information disclosure, public consultation, and public participation are part of this overall process of attaining meaningful stakeholders' consultation and participation.
1.
115. *Public Consultation*. On 12 September 2013, MOC/PW conducted an initial public consultation in the Myanmar language and formally discussed the proposed rehabilitation of the Maubin-Pyapon Road with the stakeholders (residents from Maubin, Kyiaklat, and Pyapon; community leader; and officials of various local government offices) and requested their views. Aside from the MOC/PW staff, a total of 43 stakeholders and representatives participated in the initial public consultation.

116. Kyiaklat Pyapon Stakeholders expressed support to the proposed rehabilitation of the Maubin-Pyapon Road. Summary of the consultation outcomes is presented in Table 6.1, while the documentations are presented at the appendices.

117. The public consultation started with U Kyaw Shein, Deputy Chief Engineer, Planning Department of MOC/PW welcoming the participants and encouraged them to participate actively in the meeting. He explained that the purpose of the public consultation is to seek advice and opinions from the participants about the proposed rehabilitation of the Maubin-Pyapon Road. MOC/PW gave a powerpoint presentation of the details of the proposed works under the road rehabilitation project. Also presented was a powerpoint of the draft GRM for the project.

118. After the powerpoint presentation, the participants were encouraged to ask question and raise their concerns. The discussions mainly centered on involuntary resettlement issues despite the encouragement of MOC/PW to the participants to also raise environmental issues. The TA consultants further clarified that the initial public consultation is also part of the requirements under ADB's SPS to ensure that a meaningful stakeholders' consultation and participation was conducted.

119. A representative of the Kyiaklat General Administrative Department asked how MOC/PW will handle those people who illegally occupied portion of the ROW of the road in the area of Kyiaklat. He also offered to help in coordinating with other offices regarding the removal of lamp posts, telecommunication posts, and existing pavement in his area. MOC/PW explained that any action to be taken by MOC/PW regarding this issue will be in accordance with the Myanmar's Road Law.

120. The Project's Resettlement Specialist, TA Consultant, provided clarifications on the involuntary resettlement issues and the manner of handling the present obstruction within the ROW. It was further clarified that the construction activities will be within the construction limits which is narrow than the width of the ROW.

121. Land along the road has been used as source of fill materials in previous construction activities for the project road. Consequently, a farmer asked if those farmers along the road whose land will be a source for earth fill materials will be compensated. It was clarified that any soil taken from land beyond the 150 feet ROW will be compensated. The study on fill materials was ongoing at the time of consultation. Hence, the information on fill materials was still preliminary during the meeting.

122. Along the roadsides, several trees were planted by the government's forestry department. A representative from this department asked about the arrangement for the

removal of the trees that they have planted along the road. MOC/PW responded by saying that MOC/PW and the Forestry Department will discuss further about this matter. The removal of trees planted by the local people is covered by a separate project report on involuntary resettlement. As discussed in para. 68 above, MOC will secure tree cutting permit for trees with dbh of at least 0.6 m and will replace all cut trees planted by the Forestry Department upon completion of construction in compliance with MOECF requirements.

123. Those who talked during the meeting expressed their support to the proposed road improvement since it will greatly benefit the people of the 3 towns, Maubin, Kyiaklat, and Pyapon, and even places beyond these towns. This was emphasized by the Head of the General Administration for Maubin District who informed the participants that the road is a main road for all southern part of Ayeyarwaddy and very useful for various sectors such as health, education, and business. Representatives who expressed the same sentiments included the women sector, transport sector, Pyapon local government unit (LGU), and Kyiaklat LGU.

Table 6.1: Summary of Consultation Outcomes

Group Represented	Issues/ Concerns Raised	Project's Response
Kyiaklat LGU	How will MOC/PW handle those people who illegally occupied portion of the ROW of the road in the area of Kyiaklat?; also expressed support to the project	MOC/PW actions will be in accordance to the Myanmar's Road Law; TA Consultant, provided clarifications on the involuntary resettlement issues and the manner of handling the present obstruction within the ROW. It was further clarified that construction activities will be within the construction limits which is much lesser in width than the ROW
Farmers	Will farmers along the road whose land will be a source for earth fill materials be compensated?	MOC/PW will pay for the soil taken from those land beyond the 150 feet ROW. (Note: Payment to land owners will be made through the contractors for who will obtain materials outside the Project's ROW).
Government Forestry Department	What would be the arrangement for the removal of the trees that the Forestry Department planted along the road?	MOC/PW and the forestry department of MOECF will discuss further about this matter (This aspect is covered by a separate involuntary resettlement plan prepared by the project's resettlement specialist.)
Women sector	Expressed opinion that those people whose land will be used for the construction activities will be compensated for their losses	MOC/PW actions will be in accordance with Myanmar's Road Law and ADB's SPS.
Maubin LGU	Expressed support since the road is a main road for all southern part of Ayeyarwaddy and very useful for various sectors such as health, education, and business	MOC/PW is grateful for the support

Group Represented	Issues/ Concerns Raised	Project's Response
Pyapon LGU	expressed support for the proposed project and hope that it will bring more benefits to the people	MOC/PW is grateful for the support

LGU = local government unit, MOC = Ministry of Construction, MOECF = Ministry of Environmental Conservation and Forestry, PW = Public Works, ROW = right-of-way, SPS = safeguards policy statement, TA = technical assistance.

124. *Future Disclosure and Consultations*. Public consultation and participation activities will again be conducted in the future. Stakeholders' consultations will be continued throughout the construction phase on an area by area basis to sort out any potential problems. These will be done by MOC/PW and contractors prior to actual construction activities. In these construction consultations, specific concerns of the people such as the disturbance associated with the hauling of materials in their area will be discussed in detail. Records of environmental and social complaints, received during consultations, field visits, informal discussions, and/or formal letters, together with the subsequent follow-up and resolutions of issues will be kept.

VII. GRIEVANCE REDRESS MECHANISM

125. Local GRM is important in the planning and implementation of project since any complaints and concerns of the affected people must be addressed promptly at no costs to the complainant and without retribution. There will be 2 types of GRMs. The first one will address the grievances associated directly with the construction activities, while the second one will address the grievances on issues associated with involuntary resettlement. The draft construction GRM, as shown below, was presented to stakeholders' representatives during the initial public consultation meeting for the project last 12 September 2013 at Maubin. Prior to the start of the construction activities, the construction GRM will again be discussed with the people in the project area, particularly during the formation of the village committees that will handle future complaints should they arise.

A. Construction Activities Grievances

126. There will be three levels of GRM during the construction period. The first level GRM will handle the first instance of a complaint. If not resolved, then the complainant will go to the next levels.

127. *First Level GRM*. A fast resolution to most grievances during construction can easily be handled by the contractors' representatives at the construction site and whenever necessary together with the construction supervision staff of MOC/PW at the site. All complaints received by the contractor will be documented and to be relayed to the CSC and MOC/PW within 24 hours of receiving. At this first level, the grievance should be resolved within 2 days maximum. If the complaint is not resolved at this level, the complainant may elevate his grievances to the second level GRM which is the temporary VECC. The affected person will also have the option to directly file the complaint with the VECC.

128. *Second Level GRM*. In every village, where a construction activity will be implemented, an ad-hoc VECC will be created and will be chaired by the MOC/PW representative at the field. Members will include the following: (i) contractor's highest official at the site such as the Contractor's Construction Manager or Construction Superintendent, (ii) village chief or his representative, (iii) a women organization's representative, and (iv) CSC representative, preferably the national environment specialist. Creation of the VECC and its operation, including the procedures for filing of complaints, will be included in appropriate sections of the civil works contracts with the contractors.

129. For a road rehabilitation project, fast resolution of complaints during construction is important since activities are sometimes continuous and several changes may occur within a week. For the quick filing of complaints, the VECC will prepare a form to be used for the filing of complaints. The use of form will also facilitate the filing of complaints by persons who cannot write through the assistance of another person.

130. The second level GRM steps to be followed in filing complaints and the procedures for handling are the following: (i) complainant will provide the background information and file the complaint verbally or in writing to the VECC. The VECC secretary will assist the complainant in filling-up the complaint form and will refer the complaint to MOC/PW and the CSC; (ii) within 2 working days, MOC/PW representative at the field, CSC representative, contractor's representative, and complainant will discuss if the complaint can be resolved without calling for a VECC meeting; (iii) if the complaint cannot be resolved by the MOC/PW representative and contractor's representative, a VECC meeting will be called with the complainant to resolve the complaint within 5 working days.

131. *Third Level GRM*. If the complaint cannot be resolved at the VECC, the complainant may take further action through an appropriate legal channel such as the local court.

Table 7.1: GRM Processing of Complaints

GRM Level	Maximum number of days to decide on complaint	Persons to Handle the Complaint
First level	2 days	Contractors' representatives at the construction site
Second level	1 day	VECC secretary receipt of complaint and referring it to MOC/PW
	2 days	MOC/PW' representative, contractor's representative
	5 days	temporary VECC
Third level	---	Legal channels

GRM = grievance redress mechanism, MOC = Ministry of Construction, PW = Public Works, VECC = village environmental complaints committee.
Note: The GRM will be implemented during the construction period by the Maubin MOC/PW unit and the Pyapon MOC/PW unit at their respective jurisdictions. The GRM will be disseminated to the public by MOC/PW through the use of flyers and billboards with information on the contact persons and the procedures for receiving and processing of complaints.

B. Resettlement Activities Grievances

132. A separate report on Resettlement Plan was prepared for the Maubin-Pyapon Road Rehabilitation Project. The report contains a GRM addressing issues on involuntary resettlement.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

133. This section addresses the need for mitigation and management measures for the Maubin-Pyapon Road Rehabilitation Project. Information includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangement. Institutional setup is presented in the implementation arrangement and discusses the roles during implementation and the required monitoring. It also outlines the requirements and responsibilities during pre-construction, construction, and operation phases.

A. Environmental Mitigation

134. Table 8.1 presents the information on: (i) required measures for each environmental impact that requires mitigation, (ii) locations where the measures apply, (iii) associated cost, and (iv) responsibility for implementing the measures. Details of mitigating measures have been discussed in Section V where the need for mitigation of each impact was determined in the screening process.

135. During the pre-construction phase, the cost of preparing tender documents with provisions for the required environmental measures is included in the TA cost. The cost of meetings for stakeholders' consultations is minimal costs to MOC/PW. During construction, all cost of environmental mitigation measures will be borne by the contractors and are considered part of their contracts as specified in the contract documents. During the operation phase, all cost of mitigation measures are part of the operation and maintenance costs of Maubin and Pyapon MOC/PW offices.

136. For budgetary purposes of the overall cost of Maubin-Pyapon Road Rehabilitation Project cost, the EMP costs will not be taken as separate environmental costs since they are already part of specific items such as MOC/PW project preparation cost, contractors' contracts, and Maubin and Pyapon MOC/PW offices operation and maintenance costs. Capacity building cost associated with the services of an International Environment Specialist/Advisor will be part of the construction supervision contract.

137. **Budget for Environmental Mitigation Measures of Construction**. The construction contract documents will contain a provision allocating part of the construction cost for the implementation of the environmental mitigating measures during construction. For budgetary purposes, this is estimated at 0.5% of the total construction base cost of the road rehabilitation civil works and estimated at $0.236 million.

138. To ensure that funds will be allocated during implementation of the Maubin-Pyapon Road Rehabilitation Project, the tender documents during the bidding process will include provisions stating that the cost of implementing the EMP (mitigations and monitoring) is to be included in the contractor's bid prices. This will allow the construction supervision engineer of the Maubin-Pyapon Road Rehabilitation Project to require the contractor to address expeditiously the environmental issues during construction.

Table 8.1: Environmental Mitigation Plan of Maubin-Pyapon Road Rehabilitation

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
Pre-construction/Prior to start of Site Works				
1) Climate change vulnerability of Maubin-Pyapon Road	a. 2008 flood level caused by a category 3 cyclone will be the basis for climate change adaptation considerations b. road height will be increased to avoid submerging the road in future large floods c. road height increase by average of 0.25 m in rural areas and by approximately 0.10 m in Kyiaklat	Part of detailed design cost	Consultants and MOC (PW)	
2) Improper implementation of the Project EMP.	a. Contractor to engage a full time Environmental Officer who will oversee proper implementation of construction-related aspects of the project EMP and CEMP. b. Prior to commencement of site works, prepare a CEMP based on the project EMP with details of staff, resources, implementation schedules, as well as monitoring and reporting procedures. The CEMP will also include a construction site health and safety management plan. The plan will provide guidance to the contractor's staff on good work practices on the project to prevent accidents involving workers and the general public. The plan will also include emergency procedures and the required resources, clear description of responsibilities and management, specific requirements of occupational health and safety policies and regulations, training requirements, and site safety rules. The CEMP will be reviewed and approved by the CSC. The CEMP will also be reviewed by ADB prior to approval by the CSC.	Part of contractors' bid cost	Contractor	CSC and MOC/PW
3) Lack of consultation with affected people during project implementation	Stakeholders' consultations will be carried out before start of site works and will be continued throughout the construction phase on an area by area basis to	Part of contractors' bid cost	Contractor, MOC/PW	CSC, MOC/PW

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
	resolve any potential problems. These will be done by MOC/Public Works, the CSC, and contractors to: (i) inform affected people on the location and schedule of various construction activities, (ii) determine concerns of affected people related to such activities, (iii) ensure that appropriate mitigation measures will be implemented to address construction-related environmental issues raised by the affected people.			
4) Complaints due to project-related impacts	Prior to commencement of site works, MOC/Public works, the CSC, and the contractor will undertake the following in consultation with local people and local officials: a. establish a first level Grievance Redress Mechanism GRM as described in the project's Initial Environmental Examination (IEE) – contractor's responsibility b. establish a second level GRM as described in the IEE (MoC/Public Works' responsibility) c. publicize the existence of the GRM through public awareness campaigns, billboards, public notifications, etc. d. ensure that the names and contact numbers of representatives of the contractors, the CSC, and MoC/Public Works are placed on notice boards at the construction sites.	Part of contractors' bid cost and Project cost	Contractor, CSC, MOC/PW	CSC, MOC/PW
5) Disruption of utilities/services	a. Water supply pipelines, power supply, communication lines, irrigation facilities and other utilities that will be affected by construction will be relocated before construction works commence so that interruption of services will be minimized. b. Provision will be made to preserve the operation	Part of contractors' bid cost and Project cost	Contractor, MOC/PW	CSC, MOC/PW

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
	of current facilities in sufficient quantity and in agreement with the local community. c. Relocation will be undertaken in coordination with the utility company and local authorities. d. Affected households and establishments will be notified well in advance of any disruption. e. Replacement structures (e.g., irrigation canals) will be constructed prior to the removal of the existing structure.			
6) Improper disposal of excavation spoils and removed pavement	Before commencement of excavation works and removal of pavement, obtain the CSC's approval of the disposal sites. Such sites will meet the following criteria: a. Located at least 50 m from watercourses b. Will not cause sedimentation or obstruction of the flow in watercourses c. Will not cause damage to productive areas	Part of contractors' bid cost and Project cost	Contractor	MOC/PW
	Before commencement of excavation works and removal of pavement, undertake inspection and approval of the contractors' disposal sites to ensure that the above EMP criteria (a to c) for such sites are met.	Part of CSC cost	CSC	MOC/PW
7) Procurement of materials from illegal sources	The contractor will ensure that construction materials such as sand, gravel, aggregates, will only be obtained from sources that have the required government environmental approvals.		Contractors	CSC, MOC/PW
8) Nuisance to nearby receptors and damage to sensitive areas due to proximity of construction-related facilities	The following measures will be implemented by the contractor prior to establishment of construction-related facilities, including asphalt batching plants, casting yards, storage sites, concrete batch plants, crushing plants, quarries, and equipment maintenance facilities. a. Secure environmental approvals and permits	Part of contractors' bid cost	Contractors	CSC, MOC/PW

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
	where required prior to establishment and operation of such facilities. b. Locate facilities that emit dust and/or elevated noise levels, for example batch plants, crushers, casting yards and quarries, at least 300m from residential/ housing areas and other receptors such as places of worship, medical facilities, schools, cultural sites, etc, and at least 100m from watercourses.			
Construction Phase				
9) Tree cutting within the road ROW	a. Obtain tree cutting approval (if necessary) from the Department of Forestry b. Undertake cutting of roadside trees consistent with the requirements of the Department of Forestry (under MOECF). c. Prohibit cutting of trees for firewood and use in Project. d. Ensure that tree cutting is limited to areas that are necessary based on the project design and as approved by the relevant Government agency. e. Prepare a tree replanting program in consultation with the Department of Forestry (MOC to implement the program upon completion of construction).	Part of Project cost	MOC/PW MOC Contractor Contractor MOC	CSC MOECF CSC, MOC/PW CSC, MOC/PW
10) Potential damage to archaeological and cultural assets	a. Cease operations on a road section where artifacts or archaeological finds are discovered and immediately inform the CSC b. The CSC to notify MoC/Public Works, who will notify the relevant Government agency to obtain advice regarding the next steps. c. Work to recommence only after the relevant Government agency has provided official notification accordingly.	Part of contractors' bid cost	Contractors	CSC, MOC/PW
11) Damage to watercourses	a. Before commencement of excavation works and	Part of contractors'	Contractors	CSC, MOC/PW

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
and productive areas due to disposal of excavation spoils and removed pavement materials	removal of existing pavements, obtain the CSC's approval of disposal sites. Such sites will meet the following criteria: i. Located at least 50 m from watercourses ii. Will not cause sedimentation or obstruction of the flow in watercourses iii. Will not cause damage to productive areas b. Obtain any required agreements, approval or permits from local authorities and land owners for the disposal sites. c. Temporary spoil stock piles near agricultural areas or aquaculture ponds will be provided with a bund or silt fence around them. d. Temporary spoil stockpiles that will be in place longer than six months will be grassed.	bid cost		
12) Soil erosion and sediments from construction sites	a. Restrict the area cleared of vegetation for construction to the minimum required for immediate works. b. Divert storm water flows away from cleared areas. c. Provide sediment control structures at all earthwork construction areas. d. For embankment and drainage structure construction, ensure: (i) construction of erosion control structures where required (ii) provision of devices to reduce erosion from	Part of contractors' bid cost	Contractor	CSC and MOC/PW

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
	surface run-off, and e. sedimentation control structures are provided, as directed by the CSC, adjacent to watercourses within the construction area			
13) Damage to productive land and deterioration of water quality due to operation of borrow pits and quarries.	Requirements for quarries, crushers and borrow pits are as follow: a. The contractor will provide the CSC with adequate information regarding quarries and borrow pits, including commercial sources that will be used for the project, and the environmental mitigation measures to be instituted in those locations. The information will include locations, scale of operations, method of transport of materials, and schedule of use relative to the overall construction schedule. b. only licensed quarries and crushers will be used or the contractor will obtain its own licenses c. borrow pits will be covered by required government permits or approvals d. will not be located within 300 meters of any urban area, protected area or sensitive receptor e. topsoil will be saved for rehabilitation during closure of the quarries and borrow pits, f. quarries and borrow pits will be provided with drainage and sediment flow controls g. upon completion of extraction activities, quarries and borrow pits will be dewatered, fences and warning signs will be installed, as appropriate to avoid impacts to public health and safety h. borrow pits and quarries will be left in a tidy state with stable side slopes and proper drainage	Part of contractors' bid cost	Contractor	CSC and MOC/PW

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
14) Nuisance from noise and damage due to vibration from construction works and operation of construction equipment and vehicles	a. Provide prior notification to the community on the schedule of construction activities. b. Whenever possible, completely enclose noisy equipment to reduce noise levels. c. Position any stationary equipment that produces high noise levels (e.g., portable diesel generators, compressors, etc.) as far as is practical from receptors (e.g., houses, pagodas, etc.) d. Construction traffic routes to be defined in cooperation with local communities and traffic police to minimize noise and nuisance. e. When necessary, suitable noise control measures (e.g., noise barriers/walls, noise-reflective panels) will be used as determined by the CSC to reduce construction and equipment noise levels to acceptable levels based on the International Finance Corporation's Environment, Health and Safety Guidelines of 2007, or equivalent guideline, in the vicinity of houses, temples, and sensitive receptors. f. Impose speed limits on construction vehicles within the construction sites and through urban areas g. Locate batching plants, crushers and similar facilities at 300 meters away from residential areas and sensitive receptors. h. Operation of noisy equipment and construction works during night time (19:00-06:00) in populated areas and where sensitive receptors are found will only be undertaken after prior	Part of contractors' bid cost	Contractor	CSC and MOC/PW

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
	notification and consultation have been carried out with affected people and local officials, and suitable noise attenuation measures are implemented. i. Restrict use of vibrating rollers and operation of heavy equipment near vibration sensitive structures. j. Ensure noise levels do not exceed 55 dB(A) near residential areas during daylight hours and 45 dB(A) during night hours. k. Undertake noise measurements, as directed by the CSC, to ensure compliance with these requirements.			
15) Air pollution due to construction activities	a. Locate concrete batching plants, asphalt plants, crushing plants, materials and spoil stockpiles and other dust sources at least 300 meters away from inhabited areas and sensitive receptors b. Install appropriate air pollution control equipment and other suitable control measures to minimize dust emission, to avoid nuisance and health risks to surrounding communities c. Undertake regular water spraying on roads, work areas and other construction-related facilities near or within populated areas and other sensitive receptors d. Cover or regularly water stockpiles and spoil areas to minimize dust generation e. Prohibit use of equipment and vehicles that emit visible smoke in excess of acceptable limits. f. Provide trucks transporting construction materials with covers to minimize spills and dust emission.	Part of contractors' bid cost	Contractor	CSC and MOC/PW

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
	g. Impose speed limits for project vehicles to minimize dust emission along populated areas and other sensitive receptors. h. Prohibit burning of all types of waste generated at the construction sites, workers' camps, and other project-related facilities and activities. i. Regularly clean roads used by construction traffic to remove mud, cement, etc. j. Ensure that areas within the project area where there is heavy movement of project vehicles are provided with hard standing and kept clear of loose surface material. k. Ensure that cement and other fine-grained materials that are delivered in bulk are stored in closed containers. l. Wheel washing will be undertaken in active construction sites so that haul/delivery trucks can be cleaned of mud and dirt as they exit the work area.			
16) Oil and other hazardous materials releases	a. Train relevant construction personnel in handling of fuels/hazardous substances and spill control procedures. b. Provide maintenance shops, fuel and oil depot with impermeable flooring and drainage leading to an oil-water separator or sump where oily wash water and sludge can be collected for proper disposal. c. Undertake regular maintenance of oil-water separators/sumps to ensure efficiency. d. Carry out refueling and servicing of equipment only in areas adequately equipped to avoid leaks	Part of contractors' bid cost	Contractor	CSC and MOC/PW

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
	and spills. e. Limit quantities of chemicals, hazardous substances and fuel on site at any time, and ensure these materials are stored on site in above-ground storage tanks, within an enclosed and covered area that has an impervious floor and impervious surrounding bund, with a capacity at least 120% of the total capacity of the storage capacity. f. Locate storage areas away from water-courses, flood-prone areas, workers' camps, populated areas and other sensitive sites. g. Collect oil contaminated refuse and disposed of through recyclers / authorized waste handlers and dispose of it in authorized waste facilities h. Ensure availability of spill cleanup materials specifically designed for petroleum products and other hazardous substances where such materials are being stored and used. i. In case of spills and leaks, immediately implement suitable measures to prevent hazardous materials from spreading. Remove and properly dispose spilled and contaminated materials to avoid further pollution of the environment. j. Ensure all storage containers are in good condition with proper labeling. k. Regularly check containers for leakage and undertake necessary repair or replacement. l. Prohibit discharge of oil-contaminated water into the environment.			

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
	m. Store waste oil, used lubricant and other hazardous wastes in tightly sealed and properly labelled containers to avoid contamination of soil and water resources. n. Ensure that the transport and off-site disposal of hazardous wastes complies with applicable laws and regulations, or is in compliance with internationally accepted good practice in the absence of relevant laws and regulations. o. Ensure that the restoration of temporary work sites includes removal and treatment or proper disposal of contaminated soils. p. For bitumen transport, ensure the use vehicles are approved by local authorities for the transport of bitumen and are also in accordance with the bitumen supplier's recommendations for such transport. q. Ensure that truck drivers are familiar with the safe loading and unloading procedures for the bitumen products, including emergency procedures in the event of spillage. r. Ensure that trucks are provided with tools and materials for handling spills.			
17) Deterioration of water quality due to wastewater discharge from construction works and facilities	a. Prior to operation of concrete batching plants, construct settling/retention ponds with sufficient specifications/capacity for treatment of wastewater. b. Properly operate and maintain settling/retention ponds to reduce the concentration of total suspended solids to acceptable levels. c. Ensure that water from dewatering of excavated	Part of contractors' bid cost	Contractor	CSC and MOC/PW

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
	areas is treated to reduce total suspended solids concentration in compliance with applicable government standards.			
18) Drainage obstruction/ flooding	a. Provide and maintain temporary drainage to prevent local flooding and waterlogging. b. Ensure watercourses are not obstructed or, if obstruction is unavoidable, provide alternative temporary or permanent channels of sufficient capacity to avoid flow restriction. c. Regularly inspect and maintain all drainage channels to ensure that continue to function as required.	Part of contractors' bid cost	Contractor	CSC and MOC/PW
19) Water and land pollution due to releases of drilling wastes during bridge works	a. Collect, process in a closed system acceptable to the CSC, and dispose of bentonite slurry, mud, and other materials from bored pile construction. Ensure these materials are not disposed of in watercourses and do not cause damage/adverse impacts to the environment. b. Remove accidental discharges of bentonite mud and other waste products on agricultural land immediately.	Part of contractors' bid cost	Contractor	CSC and MOC/PW
20) Vehicular traffic congestion and hindrance to public access	a. Prepare and, after approval of the CSC, implement, a traffic management and road safety plan for the construction areas and for communities affected by construction. b. Closely coordinate with local authorities for any closure of roads or rerouting of vehicular traffic, if required. c. Ensure access in areas to be closed temporarily by provision of temporary bypass roads. d. Schedule construction activities to take into account local events such as festivities,	Part of contractors' bid cost	Contractor	CSC and MOC/PW

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
	processions, parades, etc. to minimize disruption.			
21) Pollution due to improper disposal of solid wastes from construction-related activities and workers' camps	a. Provide garbage bins and facilities within the project site for temporary storage of construction waste and domestic solid waste. b. Separate solid waste into hazardous, non-hazardous and reusable waste streams and store these temporarily on site prior to final disposal, in secure facilities with weatherproof flooring and roofing, security fencing and access control and drainage systems. c. Ensure that wastes are not haphazardly dumped within the project site and adjacent areas. d. Undertake regular collection and disposal of wastes to sites approved by local authorities. e. Prohibit burning of wastes.	Part of contractors' bid cost	Contractor	CSC and MOC/PW
22) Damage to properties and community facilities	a. Immediately repair and/or compensate for any damage caused by construction works and activities to existing communities and their property and facilities b. Maintain access roads used for transport of construction materials and other construction-related activities are maintained to ensure that they remain in at least in their pre-project condition for the duration of the project.	Part of contractors' bid cost	Contractor	CSC and MOC/PW
23) Hazard to public due to construction activities	a. Install barriers to keep pedestrians away from hazardous areas such as constructions sites and excavation sites. b. Install signage at the periphery of the construction site advising road users that construction is in progress.	Part of contractors' bid cost	Contractor	CSC and MOC/PW

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
	c. Strictly impose speed limits on construction vehicles along residential areas and where other sensitive receptors such as schools, pagodas and other populated areas located. d. Provide adequate lighting at night within and in the vicinity of construction sites. e. Provide security personnel in hazardous areas to restrict public access. f. If necessary, provide safe passageways for pedestrians crossing the construction site and for people whose access has been disrupted due to construction woks.			
24) Occupational health and safety risks	a. Perform a hazard assessment of the workplace to identify and eliminate physical and health hazards, b. Provide personnel with appropriate safety equipment such as safety boots, helmets, gloves, protective clothes, welding helmets, dust masks, goggles, ear protection, safety line, fall prevention measures, etc, broadly referred to as personal protective equipment (PPE). and ensure that these are properly used as required. c. Periodically review, update and evaluate the effectiveness of the PPE program. d. Conduct orientation for construction workers regarding health and safety measures, emergency response in case of accidents, fire, etc., and prevention of HIV/AIDS and other diseases e. Provide workers at construction sites over water with buoyancy devices at all times.	Part of contractors' bid cost	Contractor	CSC and MOC/PW

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
	f. Provide stable footpaths/access with adequate strength guardrails at bridge work sites. g. Comply with relevant laws and regulations on waterway traffic safety during construction. h. Provide first aid facilities that are readily accessible to workers. i. Provide fire-fighting equipment at the work areas, as appropriate, and at construction camps Provide adequate drainage in workers camps j. Provide adequate, clean and well-ventilated housing, with separate sleeping quarters for male and female workers, at the workers'/construction camps. k. Provide a reliable supply of potable water and water for washing and bathing purposes at the workers' camps. l. Provide separate hygienic sanitation facilities and bathing areas with sufficient water supply for male and female workers m. Ensure that all wastewater emanating from workers camps, construction camps and other project-related activities and facilities is adequately treated prior to discharge. n. Ensure proper collection and disposal of solid wastes within the workers'/construction camps consistent with local regulations. o. Provide fencing of adequate strength around excavation sites greater than 2 m deep. p. Prohibit workers from entering work sites without the appropriate PPE.			

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
	q. Ensure reversing signals are installed on all construction vehicles. r. Implement fall prevention and protection measures for heights greater than 2 m, falling into operating machinery or through an opening in a work surface. s. Ensure that objects cannot fall onto people, vehicles, and properties in adjoining areas.			
25) Improper closure of construction sites	During demobilization, the contractor will remove all wastes from the construction sites and construction-related areas, and will undertake restoration of disturbed sites.	Part of contractors' bid cost	Contractor	CSC and MOC/PW
26) Need for implementation of additional environmental mitigation measures	Implement corrective and/or additional measures to avoid, mitigate or compensate for adverse environmental impacts due to construction works and other project-related activities	Part of contractors' bid cost	Contractor	CSC and MOC/PW
Operation Phase				
27) Loss of roadside trees	Undertake tree replanting and maintenance	Part of project cost	Maubin and Pyapon PW	Maubin and Pyapon Department of Forestry
28) Water-logging and soil erosion due to clogged and inadequate drainage facilities	Implement a road drainage maintenance program to maintain design capacities of road drainage facilities; regular removal of accumulated sediments and debris at road drainage facilities; discharge points to streams and tail ditches must be inspected regularly to ensure they are stable and not deteriorating due to scour.	Part of annual routine maintenance costs of $0.08 million (TA Project Cost Report)	Maubin and Pyapon PW	Maubin, Kyiaklat, and Pyapon local government officials
29) Increased risk of road accidents	Undertake information and education campaign at the local level on the risks of road accidents associated with increase vehicular traffic; providing appropriate signs and markings at crossing sites; provision of speed limit signs and active police enforcement of speed limits at more populated areas such as the Kyiaklat section; provision of adequate	Part of annual routine maintenance costs of $0.08 million (TA Project Cost Report)	Maubin and Pyapon PW	Maubin, Kyiaklat, and Pyapon local government officials

Environmental Issues/Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Responsibility	
			Implementation	Supervision/ Monitoring
	road shoulders.			
30) Increased risk of water pollution on waterways	MOC (PW), together with the local government of Maubin, Kyiaklat, and Pyapon will prepare a spills response plan for the road; plan will contain procedures on: (i) how to stop the flow of spill, (ii) contain the spill to prevent from spreading including the storage of absorbent material for spills, (iii) cleanup of the spilled materials, and (iv) proper disposal of used spill cleanup materials; preparation of list who are transporting hazardous materials and the quantities being transported through the road	Part of annual routine maintenance costs of $0.08 million (TA Project Cost Report)	Maubin and Pyapon PW	Maubin, Kyiaklat, and Pyapon local government officials
31) Improved accessibility	Road maintenance program	Part of annual routine maintenance costs of $0.08 million (TA Project Cost Report)	Maubin and Pyapon PW	Maubin, Kyiaklat, and Phayapon local government officials

ADB = Asian Development Bank, CEMP = consultants environmental management plan, CSC = construction supervision consultant, EMP = environmental management plan, GRM = grievance redress mechanism, IEE = initial environmental examination, m = meter, MOC = Ministry of Construction, MOECF = Ministry of Environmental Conservation and Forestry, PPE = personal protective equipment, PW = Public Works, TA = technical assistance.

139. Although details of the required mitigating measures have been presented in the screening for impacts, the following items are discussed further to highlight their importance: (i) tender documents and construction contracts, (ii) contractor's EMP, (iii) road maintenance program, and (iv) unanticipated environmental impacts.

140. *Tender Documents and Construction Contracts*. Maubin-Pyapon Road Rehabilitation Project's EMP will form part of the bidding and contract documents. Environmentally responsible procurement advocates the inclusion in construction contract documents the provisions addressing the management of environmental impacts and risk during construction. This includes the contractor's submittal of a CEMP. Tender documents and construction contracts will, therefore, include environmental management provisions for the following issues: (i) erosion and sediment runoff, (ii) noise and dust, (iii) vehicular traffic, (iv) construction wastes, (v) oil and fuel spillages, (vi) construction camps, and (vii) public safety and convenience, (viii) occupational health and safety, (ix) proper closure of construction sites, and (x) potential damage to any archaeological and cultural assets.

141. *Contractor's EMP*. During construction, each contractor will be guided by its detailed CEMP. This will be based on the Maubin-Pyapon Road Rehabilitation Project's EMP with details on staff, resources, implementation schedules, and monitoring procedures. The agreed CEMP will be the basis for monitoring by MOC/PW, the Engineer/CSC, and other monitoring parties. Inclusion in the construction contract documents the provisions requiring the contractor to submit a CEMP is important since the contractor will be legally required to allocate a budget for mitigation measures implementation. The CEMP will allow the CSC to focus on what are specific items expected from the contractor regarding environmental safeguards on a day-to-day basis. With the CEMP, construction supervision staff can easily verify the associated environmental requirements each time the contractor will request approval for work activities.

142. The CEMP will be prepared by each contractor before the start of the construction works and will be reviewed and approved by the CSC. The CEMP will also be reviewed by ADB prior to approval by the CSC. This requirement will be included in the bidding documents and construction contracts. During construction and when the need arises, the CEMP will be updated.

143. *Spoils Disposal Sites*. Before excavation and removal of pavement commence, the environmental personnel of CSC and MOC/PW will undertake inspection and approval of the contractors' disposal sites to ensure that the EMP criteria for such sites are met.
2.
144. *Road Maintenance Program*. Presently, MOC/PW has implemented a maintenance program for the existing Maubin-Pyapon Road. This program is expected to continue with the rehabilitated road. It is estimated that the cost of maintenance will decline after the road is upgraded with an annual routine maintenance of $0.08 million (TA Project Cost Report. 2013).

145. *Unanticipated Environmental Impacts*. Where unanticipated environmental impacts become apparent during project construction, MOC/PW will require the CSC to prepare a supplementary environmental assessment report based on ADB's SPS to assess the potential impacts and provide environmental management measures and resources to address those impacts.

B. Environmental Monitoring

146. Table 8.2 presents the information on: (i) aspects or parameter to be monitored, (ii) location where monitoring is applicable, (iii) means of monitoring, (iv) frequency of monitoring, (v) responsibility of compliance monitoring, and (vi) cost of monitoring.

Contractors' environmental performance will be monitored based on the mitigation measures specified in Table 8.1.

147. MOC/PW Project Environment Officer with assistance from the international and national environment specialist of the CSC will prepare monthly and semi-annual environmental monitoring reports. Only the semi-annual environmental monitoring report will be submitted to ADB. The semi-annual environmental monitoring report, which will be publicly disclosed on ADB's website, will provide details on the status of mitigating measures implementation, among others. The suggested outline of the monitoring reports is presented in Appendix 7. Roles of the various offices of MOC/PW for the project, contractors, and the construction supervision consultants are outlined in the succeeding section for institutional arrangement.

148. *Environmental Monitoring Cost*. Monitoring cost for pre-construction is minimal cost to MOC/PW since this is simply verification on whether the EMP is included in tender and contract documents. Construction monitoring cost is minimal cost to MOC/PW since this is checking and/or inspecting the construction activities, and is part of the operational costs. Monitoring cost of construction supervision consultants are also minimal costs since this is the checking and/or inspections cost and part of their contracts. The cost to Maubin and Pyapon MOC/PW Offices for the GRM is also minimal cost since these are only meetings for resolving the complaints and it is included in the contractor's contract. Costs for monitoring by the Maubin and Pyapon MOC/PW Offices during the operation phase are minimal costs since these will only involve visual inspections and records verifications.

Table 8.2: Environmental Monitoring Plan of Maubin-Pyapon Road Rehabilitation

Aspects/ Parameters to be monitored[7]	Location	Means of Monitoring	Monitoring Frequency	Mitigation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
PRE-CONSTRUCTION						
CEMP prepared by contractors	Entire road length	CEMP submittal by contractors to CSC	Prior to commencement of site works	contractors	Consultants and MOC (PW)	Part of consultants task (minimal cost)
Road engineering drawings and specifications considered climate change adaptation features	Entire road length	Verify engineering drawings and specifications	once	Consultants prepare bidding documents	Consultants supervise contract drawings preparation	Part of consultants task (minimal cost)
Consultation meetings; specific provisions in tender documents on nuisance and problems to public; GRM activated with VECCs created	Entire road length	Verify meetings documentation; Verify tender documents; verify the in-placed VECCs	After completion of meetings; once after tender documents prepared	Consultants prepares the tender documents; contractor and MOC/PW activated the GRM and created VECCs	Consultants and MOC (PW)	Part of consultants task (minimal cost)
Specific provision in tender documents on archeological/ cultural relics	Entire road length	Verify tender documents	once after tender documents prepared	Consultants prepares the tender documents	Consultants and MOC (PW)	Part of consultants task (minimal cost)
Consultation meetings; payments to affected people; contractors' coordination with power and telecommunication agency	Entire road length	Verify meetings documentation; Verify plans and involuntary resettlement payments	After completion of meetings; upon completion of payments	MOC (PW)/ contractor	Consultants and MOC (PW)	Part of MOC /PW' project preparation (minimal cost)
CONSTRUCTION PHASE						
Presence of archeological/ cultural relics in excavations	Entire road length; borrow pits	Visual inspection of sites	Daily	contractor	CSC and MOC (PW)	Part of CSC contract; minimal cost to MOC (PW)
Total area to be exposed; runoff flowing into disturbed sites; use of appropriate sediment controls; silt	Entire road length; quarries and borrow pits	Visual inspection of sites; plans	Daily during rainy periods	contractor	CSC and MOC (PW)	Part of CSC contract; minimal cost to MOC (PW)

[7] The CSC will monitor compliance with each mitigation measure specified in the Project EMP and CEMPs.

Aspects/ Parameters to be monitored[7]	Location	Means of Monitoring	Monitoring Frequency	Mitigation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
screens near bridges;		verification				
Noise levels not to exceed 55 dB(A) near residential areas during daytime and 45 dB(A) for nighttime; noisy equipment not be operated between 19:00 – 06:00hrs; ear plugs for workers	Entire road length, particularly the Kyiaklat section	Use of sound levels meter; visual inspection of sites	Daily	contractor	CSC and MOC (PW)	Part of CSC contract; minimal cost to MOC (PW)
Dust, cover of stockpiles, smoke emitting equipment, vehicle speed at unpaved road sections; open burning of materials	Entire road length, particularly the Kyiaklat section; quarries and borrow pits	Visual inspection of sites	Daily	contractor	CSC and MOC (PW)	Part of CSC contract; minimal cost to MOC (PW)
Relevant construction personnel received training in handling of fuels/hazardous substances and spill control procedures; contractor's compliance to requirements on: (i) impermeable flooring with drainage leading to an oil-water separator for maintenance shops, fuel and oil depot, (ii) enclosed and covered secure area with impervious floor and impervious bund for storage area of hazardous substances and fuel, (iii) availability of spill cleanup materials, (iv) tightly sealed containers for storage of waste oil, used lubricant and other hazardous wastes; bitumen trucks approved for transport of bitumen	Entire road length; fuel and oil storage area	Visual inspection of sites	Daily	contractor	CSC and MOC (PW)	Part of CSC contract; minimal cost to MOC (PW)
Use of closed system for drilling solutions; accidental spills of drilling wastes; immediate cleaning of spills	Oo yin chaung bridge	Visual inspection of sites	Daily	contractor	Construction supervision consultants and	Part of CSC contract; minimal cost to MOC (PW)

Aspects/ Parameters to be monitored[7]	Location	Means of Monitoring	Monitoring Frequency	Mitigation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
					MOC (PW)	
Road closure and traffic rerouting; traffic plan; temporary bypass roads	Entire road length, particularly the Kyiaklat section; starting point in Maubin and road end in Pyapon	traffic plans verification; visual inspection of sites	weekly	contractor	CSC and MOC (PW)	Part of CSC contract; minimal cost to MOC (PW)
Road safety plan; warning signs, barricades, and night lamps for open excavations, lighting system for nighttime operations	Entire road length	traffic plans verification; visual inspection of sites	Daily	contractor	CSC and MOC (PW)	Part of CSC contract; minimal cost to MOC (PW)
Sanitary toilets, garbage bins, runoff controls in camps	Workers' camp	Visual inspection of sites	Once before start of construction and once monthly	contractor	CSC and MOC (PW)	Part of CSC contract; minimal cost to MOC (PW)
Health and safety plan; first aid station; PPE, sanitation facilities	Entire road length	Visual inspection of sites	Daily	contractor	CSC and MOC (PW)	Part of CSC contract; minimal cost to MOC (PW)
Number of local labor employed	Entire road length	Verification of contractor's records	Once a month	contractor	CSC and MOC (PW)	Part of CSC contract; minimal cost to MOC (PW)
Construction wastes; surplus soil not removed	Entire road length; fuel and oil storage area; staging areas; workers' camp;	Visual inspection of sites	Once before final stage of demobilization; weekly for surplus soil	contractor	CSC and MOC (PW)	Part of CSC contract; minimal cost to MOC (PW)
OPERATION PHASE						
Number of clogged drainage facilities	Entire road length	Visual inspection of	4 times per year	Maubin MOC (PW) and Pyapon MOC	Maubin, Kyiaklat, and Phayapon	Minimal cost since it is only visual

Aspects/ Parameters to be monitored[7]	Location	Means of Monitoring	Monitoring Frequency	Mitigation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
		sites; verify records		(PW)	local government officials	inspection and records verification
Number of road accidents	Entire road length	Visual inspection of sites; verify records	4 times per year	Maubin MOC (PW) and Pyapon MOC (PW)	Maubin, Kyiaklat, and Pyapon local government officials	Minimal cost since it is only visual inspection and records verification
Number of water pollution incidents due to road use	Entire road length	Visual inspection of sites; verify records	4 times per year	Maubin MOC (PW) and Pyapon MOC (PW)	Maubin, Kyiaklat, and Pyapon local government officials	Minimal cost since it is only visual inspection and records verification
Traffic volume increase	Entire road length	Annual survey of traffic volume	Once a year	Maubin MOC (PW) and Pyapon MOC (PW)	Maubin, Kyiaklat, and Pyapon local government officials	Minimal cost to PW since it is only once a year ($2,000/year)

CEMP = contractors' environmental management plan, CSC = construction supervision consultant, GRM = grievance redress mechanism, MOC = Ministry of Construction, PPE = personal protective equipment, PW = Public Works, VECC = village environmental complaints committee.

149. *Ambient Environmental Baseline*. Presently, there are no available ambient environmental data specific to the construction area for surface water quality, air quality, and noise. In order to establish the environmental ambient baseline information before the construction activities, the contractor will be required to conduct an environmental baseline monitoring for surface water quality, air quality, and noise (Table 8.3). This requirement will be included in the bidding/contract documents. The activity will be supervised by the IES of the CSC. The generated data will be evaluated later using IFC's guidelines (EHS Guidelines of April 2007). Results will be submitted to ADB for disclosure on ADB's website.

150. Cost of this initial environmental baseline monitoring (water quality, air quality, and noise levels) will be included in the contractor's bids and contracts.

Table 8.3: Initial Ambient Environmental Baseline Monitoring to be Carried Out by the Contractor before Start of Site Works

Module	Sampling Parameter	Sampling Frequency[a]	Location
Water Quality	(i) total suspended solids, (ii) biochemical oxygen demand, (iii) dissolved oxygen, (iv) fecal coliform, (v) oil and grease, and (vi) pH	once	Nearest waterway to construction camps; waterways of the following culvert/bridges: (i) Kyar Ga Yet Yoe, (ii) Ngar Yit Sal, (iii) Kha Naung, (iv) Pa Kout Yoe, (v) Pa Kout Yoe, (vi) lat Tat Gyi Yoe, (vii) Mayan Yoe, (viii) Htein Pin Yoe, (ix) Lata Gyi, (x) Oo Yin Chaung, (xi) Kyee Chaung, (xii) Hlal Sate, (xiii) Kha Naung, (xiv) Gonhnyintan, (xv) Thaleik kyee, (xvi) Thaleik kalay, and (xvii) Chaung Twin
Air Quality[b]	(i) total suspended particulates (ii) sulfur dioxide (iii) nitrogen dioxide, and (iv) carbon monoxide	once	Residential areas (preferably near a school, medical facility, if present) along the project alignment in Maubin, Kyiaklat and Pyapon
Noise Levels[b]	dB(A)	once	Same locations for air quality sampling

[a] Additional ambient sampling will also be conducted by the contractor during the construction phase under the following conditions: (i) to verify complaints, and (ii) in case there are pollution events/discharges that may be attributed to the Project.

[b] Sampling periods for noise and averaging periods for air quality will be undertaken consistent with and will be compared to IFC's Environmental, Health and Safety Guidelines (2007).

151. *Project Performance Monitoring*. Project performance monitoring presents the desired outcomes as measurable events by providing parameters or aspects that can be monitored and verified (Table 8.4). Construction phase desired outcomes include effective management of environmental impacts and reduce risk to the public and workers. Desired outcomes of the operation phase are the road drainage system performing well, very few vehicular accidents, few accidental spills of fuel and other materials, and no complaints on noise levels.

Table 8.4: Project Performance Monitoring of Maubin-Pyapon Road Rehabilitation

Desired Outcomes	Aspects / Parameters to be monitored	Means of Monitoring	Monitoring Frequency	Implementation	Compliance Monitoring	Monitoring Cost
PRE-CONSTRUCTION PHASE						
road design is environmentally responsive	EMP requirements incorporated in design of Maubin-Pyapon road rehabilitation	Verify engineering drawings and specifications	once	Consultants prepare bidding documents	TA consultants	Part of consultants task (minimal cost)
Tendering process advocates environmentally responsible procurement	EMP requirements incorporated in construction contracts of Maubin-Pyapon road rehabilitation	Verify draft construction contract documents	Prior to finalization of construction contract documents of Maubin-Pyapon road rehabilitation	MOC; Consultants prepare bidding documents	TA consultants	Part of consultants task (minimal cost)
CONSTRUCTION PHASE						
Effective management of environmental impacts during construction	Number of public complaints on construction activities; Number of notices to contractors on non-compliance of required environmental mitigation measures	Verification of contractor's records; MOC/PW coordination with local officials	Once a month	Contractor	CSC, MOC/PW Project Environment Officer	Part of consultant's construction supervision contract; minimal cost to MOC's Road Construction Special Unit
Reduce risk to workers and the public during construction	Number of accidents involving construction activities	Verification of contractor's records; MOC/PW coordination with local officials	Once a month	Contractor	CSC, MOC/PW Project Environment Officer	Part of consultant's construction supervision contract; minimal cost to MOC's Road Construction Special Unit
OPERATION PHASE						
Road drainage system performed well	Clogged and damaged drainage system	Verification of MOC/PW	Once a year	Maubin-Pyapon PW Offices	Local government	Minimal cost since only

Desired Outcomes	Aspects / Parameters to be monitored	Means of Monitoring	Monitoring Frequency	Implementation	Compliance Monitoring	Monitoring Cost
		operation records and community records			units of Maubin, Kyiaklat, and Pyapon	information verification and site visit
Very few vehicular accidents due to effective traffic management	Number of vehicular accidents	Verification of MOC/PW operation records and community records	Once a year	Maubin-Pyapon PW Offices	Local government units of Maubin, Kyiaklat, and Pyapon	Minimal cost since only information verification and site visit
Few accidental spills of fuel and other materials	Number of accidental spills	Verification of MOC/PW operation records and community records	Once a year	Maubin-Pyapon PW Offices	Local government units of Maubin, Kyiaklat, and Pyapon	Minimal cost since only information verification and site visit
No complaints on noise levels	Complaints on noise levels	Verification of MOC/PW operation records and community records	Once a year	Maubin-Pyapon PW Offices	Local government units of Maubin, Kyiaklat, and Pyapon	Minimal cost since only information verification and site visit

CSC = construction supervision consultants, EMP = environmental management plan, MOC = Ministry of Construction, PW = Public Works, TA = technical assistance.

C. Implementation Arrangement

152. This subsection presents the: (i) institutional arrangements, (ii) implementation schedule, (iii) MOECF environmental monitoring, and (iv) capacity building.

153. *Institutional Setup*. Institutional arrangements start with MOC as the executing agency for the project. MOC's PW is the implementing agency. The key implementing unit in the field is the PMU reporting directly to the PW Managing Director. For the environmental aspects of the project, a PMU staff member will be designated as the Environment Officer for the project to oversee the implementation and monitoring of the project's environmental safeguards requirements.

154. The project's civil works will be implemented by contractors selected by MOC in accordance with ADB's procurement procedures. The contractors will be supervised, for compliance with the civil works contract legal and other provisions, by an international consulting firm selected by MOC, also in accordance with ADB's procurement procedures. This consulting firm will be the Engineer for the contracts (referred to as the construction supervision consultant or CSC in this IEE. The CSC team will include an IES who will be supported by an NES. Together, the IES and NES will be responsible for the following activities related to environmental safeguards: (i) confirming that the EMP is included in the bidding documents and civil works contracts; (ii) ensuring the CEMPs are prepared by contractors, reviewed by ADB and CSC, and approved by CSC prior to construction commencing; (iii) establishing a system to monitor the environmental aspects of the project including the indicators set out in the monitoring plan of the EMP; (iv) supervising the implementation of environmental mitigating measures required for the construction activities; (v) reviewing, monitoring, and evaluating the effectiveness of the implemented CEMPs, and recommending corrective actions, if required; (vi) preparing monthly environmental monitoring reports for PMU, (vii) preparing semi-annual environmental monitoring reports for ADB's review and public disclosure; (viii) addressing, recording, and reporting on any grievances arising from the project's GRM in a timely manner; and (ix) training MOC/PW staff in environmental safeguards and monitoring.

155. The IES will undertake the initial monthly monitoring together with the NES. Detailed guidance onsite inspection and report preparation will be provided by the IES to the NES. Subsequent monthly monitoring would be carried out by the NES while the IES will undertake semi-annual monitoring and report preparation along with the NES. The semi-annual report will be based on the results of monthly monitoring. NES input will be for a total of 22 person-months (i.e., 10 person-months for the first year of the construction, and 6 person-months each for the remaining two years of construction). IES input is 6 person-months.

156. The Maubin and Pyapon MOC/PW offices will support the PMU and play an important role in the implementation of the GRM. Staff of the Maubin and Pyapon MOC/PW offices will sit as chairpersons in the temporary VECC that will be activated during the construction period. A training program will be conducted for MOC/PW staff on how the environmental aspects of the project will be monitored. It is part of the project's capacity building on environmental monitoring.

157. The construction contractors for the project will be responsible for implementing the required environmental mitigation measures as defined by their respective approved CEMPs. The contractors will designate their Environment Officer. Close coordination between the contractors and the CSC is needed to ensure good planning for mitigation measures and ensure the timely implementation. The contractors are also directly involved in addressing grievances during the construction period since their activities will cause

disturbances to the public. The contractor's most senior representative at the site, such as the Construction Manager or Construction Superintendent, will be a member of VECCs.

158. During the operation phase, environmental impacts will be associated with the use and maintenance of the Maubin-Pyapon Road. Consequently, any environmental matters will be the responsibility of the Maubin and Pyapon MOC/PW offices after the defects liability phase of the construction contracts.

159. Table 8.5 presents information on where the environmental aspects are addressed in the institutional setup and the associated requirements for environmental consultants.

Table 8.5: Environmental Aspects Institutional Setup

Unit	Unit Functions	Responsible for Environmental Aspects/ Functions	Consultants/ Functions
Construction Phase			
MOC	Executing Agency for the Maubin-Pyapon Road Rehabilitation Project; overall responsibility over the investment	Will rely on the Project Environment Officer of the PMU	None
Office of PW Managing Director	Responsible for project implementation; coordinates with ADB and other external agencies	Will rely on the Project Environment Officer of the PMU	Advisory services to be provided by the IES (part of CSC)
PMU (from MOC/PW main office in Naypyitaw)	Key implementation unit in the field; reports directly to the Office of PW' Managing Director Provides overall project management, closely monitors construction progress	Project Environment Officer (to be designated); responsible for overseeing/ monitoring of environmental supervision of construction activities; coordinates with the CSC to ensure that the CEMP is properly implemented and monitored; prepares monthly and semi-annual environmental monitoring reports; coordinates with MOECF, the environment agency	The IES (part of CSC), with support from the NES, will: (i) assist MOC/PW in monitoring of CEMP implementation, (ii) train MOC/PW staff in environmental safeguards and monitoring; and (iii) assist MOC/PW in preparation of monthly, and semi-annual environmental monitoring reports.
Maubin and Pyapon MOC/PW Offices	Provides support to the PMU	Designate staff to sit as Chairperson of the ad-hoc VECCs during construction; assists the VECC in addressing environmental complaints;	
Construction contractors of the Maubin-Pyapon Road Rehabilitation Project	Implement construction activities; implement the CEMP	Contractor's Environment Officer (to be designated); responsible for preparation and implementation of the CEMP; coordinates with local officials; assist PW in addressing environmental complaints; contractor's highest official at the site such as the Construction Manager or Construction	

Unit	Unit Functions	Responsible for Environmental Aspects/ Functions	Consultants/ Functions
		Superintendent sits as a member of the VECC	
Operation Phase			
Maubin and Pyapon MOC/PW Offices	Responsible for the Maubin-Pyapon Road	responsible for all environmental matters of the Maubin-Pyapon Road after the defect liability phase of the construction contracts	

ADB = Asian Development Bank, CEMP = contractors' environmental management plan, CSC = construction supervision consultant, IES = international environmental specialist, MOC = Ministry of Construction, MOECF= Ministry of Environmental Conservation and Forestry, NES = national environmental specialist, PMU = project management unit, PW = Public Works, VECC = village environmental complaints committee.

160. *Implementation Schedule*. As presented in the project description, rehabilitation of the Maubin-Pyapon Road is scheduled to start on March 2015 and expected to be to be fully operational by end of 2017. MOC/PW will ensure that construction contract provisions related to the contractor's EMP will be included in the tendering stage in 2014.

161. *MOECF Environmental Monitoring*. The Environmental Conservation Department of MOECF was established on October 2012, following the enactment of Myanmar's Environmental Conservation Law. MOECF confirmed that as of now, there are no units below the office of the Director within their organization. Based on this institutional situation, it is still not known how the Environmental Conservation Department of MOECF will conduct environmental monitoring of infrastructure projects.

162. *Environmental Monitoring Capacity Building*. Presently, MOC/PW does not have a dedicated environmental unit to handle the environmental requirements of its projects. In fact, the context of environmental monitoring for infrastructure projects in Myanmar can better be understood with the fact that MOECF's Environmental Conservation Department was only established recently following the enactment of Myanmar's Environmental Conservation Law.

163. Within this context, MOC/PW need capacity building on environmental monitoring of road construction projects. This project's implementation is a good opportunity to introduce the practice of environmental monitoring for infrastructure projects. An important aspect of the IES and NES scope of work will be to provide training and guidance on environmental management to MOC/PW staff.

164. Tasks of the IES and NES will include the following:

(i) Prior to review by ADB, review the submitted CEMPs and recommend to the CSC the necessary items and modifications to the CEMPs in order to be compliant with the: (a) environmental requirements of the construction contracts as reflected in the EMP specifications, (b) environmental laws of the Government, and (c) ADB's SPS;
(ii) Supervise the ambient environmental baseline monitoring (water quality, air quality, and noise levels) to be conducted by the contractors through an accredited and/or licensed laboratory;
(iii) Prior to commencement of site works, the CSC together with MOC/Public Works and the contractor will undertake consultation with local people and local officials regarding establishment of the grievance redress mechanism (GRM) as described in the project's Initial Environmental Examination (IEE).
(iv) Before excavation works and removal of pavement commence, undertake inspection and approval of the contractors' disposal sites to ensure that the EMP criteria for such sites are met;
(v) Develop the environmental monitoring system to be used during the construction period for monitoring the contractors' performance relative to the environmental requirements, including the preparation of: (a) monitoring and corrective action forms and/or checklist, (b) inspection procedures, and (c) documentation procedures;
(vi) Conduct orientation sessions with the contractors on the environmental monitoring system to be used, notification of non-compliance, and the process of requiring contractors to do corrective measures when necessary;
(vii) Within six months from commencement of civil works, design and conduct a training program for MOC/PW staff on how the environmental aspects of the project will be monitored, giving emphasis on CEMP evaluation; environmental monitoring of construction activities and preparation of corresponding report; supervision responsibilities and interaction with

contractors; and documentation, resolution and reporting of non-compliance issues and complaints;

(viii) Supervise the implementation of environmental mitigating measures required for the construction activities;

(ix) Discuss with the contractors how their respective CEMPs will be implemented including the: (i) requirements for each mitigation measure, and (ii) implementation schedule of each mitigation measure taking into consideration the general requirement that the CSC will not approve commencement of specific construction activity if the associated mitigation measures for such activity are not ready before work execution;

(x) Evaluate the environmental aspects of the contractor's construction methodology and recommend to the CSC corrective actions needed, if any, to make the methodology environmentally acceptable;

(xi) Evaluate the contractors' submitted works activities and schedules relative to the requirements of the approved CEMPs;

(xii) Undertake monthly monitoring/site inspection of construction sites and all construction-related facilities (workers' camps, asphalt batching plants, concrete batching plants, borrow pits, disposal sites for unsuitable soil/excavated materials/removed asphalt, equipment maintenance areas, fuel and materials storage sites, project-specific quarries and crushers, etc.) to assess the contractor’s compliance with the CEMP/Project EMP;

(xiii) Evaluate effectiveness of the mitigation measures, and provide guidance on the implementation of corrective measures;

(xiv) Discuss with the contractors updating of their respective CEMPs when the need arises;

(xv) Supervise any subsequent monitoring (as necessary) to be done by the contractors on ambient surface water quality, air quality, and noise during the construction period;

(xvi) Monitor the contractors' compliance with health and safety requirements of the project as stipulated in the construction contract documents;

(xvii) Prepare monthly environmental monitoring report for submission to PMU and semi-annual environmental monitoring reports (based on monthly monitoring) for submission to ADB;

(xviii) Upon completion of the construction activities, prepare a report on the project's environmental compliance performance, including lessons learned that may help MOC/PW in its environmental monitoring of future projects. The report will be an input to the overall project completion report; and

(xix) Provide guidance to MOC/PW Project's Environment Officer (assigned in the field) on the environmental aspects of the project with emphasis on environmental monitoring and reporting.

165. Cost for this capacity building on environmental monitoring will be included in the contract cost of the CSC.

IX. CONCLUSION AND RECOMMENDATIONS

166. Rehabilitating the Maubin-Pyapon Road has significant positive impacts to the served communities. This will become a reliable transport link between, Maubin and Pyapon, two of the major urban centers of the southern Ayeyarwaddy Delta. This will help provide the people with better access to markets and creates economic opportunities for them to sell their labor and products. The rehabilitated road will also facilitate access of the people to universities and colleges in Maubin from those in Pyapon, Kyiaklat, and those towns beyond the road. It will also facilitate access to health services in Maubin and further to Yangon. The project is intended to reduce travel times and transport costs in the project area. It is a priority project in the Government's key infrastructure development agenda as it will improve connectivity to the rich agricultural Ayeyarwaddy Delta. It therefore supports inclusive economic growth.

167. The environmental screening process has highlighted the environmental issues and concerns of the Maubin-Pyapon Road Rehabilitation Project. The screening has considered the fact that the project sites are essentially agricultural areas and the road has been functional for 19 years since it was first constructed in 1993. Over the years the ecological changes due to human activities in the area resulted to the present agricultural landscape. Beyond the road corridors are basically cultivated strips of land dominated by rice paddies. The entire road corridor is not within or adjacent to a protected area or a mangrove area.

168. Based on the screening for potential environmental impacts and risks of the Maubin-Pyapon Road Rehabilitation Project is not anticipated to have significant negative environmental impacts and risks. Provided that the EMP is enforced, the project can be implemented in an environmentally acceptable manner. There is no need for a further environmental assessment study. Specifically, a full EIA is not warranted and the project's environmental classification as Category B is appropriate. The IEE will, therefore, be finalized as the final environmental assessment document for the project.

169. Implementation of the project should emphasize the following from the environmental perspective: (i) the project's EMP will be considered in the road design process; (ii) the EMP will be included in the bidding and construction contract documents; (iii) each contractor will prepare a CEMP before commencement of site works; (iv) the requirement for the establishment and operation of VECCs will is to be included in the EMPs; (v) MOC/PW will designate a Project Environment Officer who, as a staff member of the PMU, will be responsible for (a) overall environmental monitoring of construction activities; (b) ensuring that the CEMPs are properly implemented and monitored; (c) preparing monthly and semi-annual environmental monitoring reports; and (d) coordinating with the environment agency, the MOECF to obtain environmental approval for the project before commencement of site works and to ensure compliance with other government environmental requirements; (vi) an IES (part of the CSC team) will assist MOC/PW with monitoring of EMP implementation; provide training to MOC/PW staff in environmental safeguards and monitoring; and assist MOC/PW in preparation of monthly and semi-annual environmental monitoring reports; (vii) monitoring of health and safety requirements in accordance with the EMP will be given importance during construction and operation to reduce risks to the public and to site personnel; and (viii) MOC/PW will continue the process of public consultation and information disclosure prior to and during the construction phase of the project.

X. APPENDICES

DRAFT ENVIRONMENTAL PERMIT PROCESSING

1. The Environmental Conservation Department of the Ministry of Environmental Conservation and Forestry (MOECF) prepared in 2012 draft environmental assessment rules. It was presented last 26 July 2013 in the "Environmental Impact Assessment (EIA) Procedures Workshop" with 150 delegates from the private and public sectors, non-governmental organizations, civil society organizations, and local EIA consultants. MOECF will be the executing agency of the proposed EIA rules as indicated in the draft rules.

2. A draft basis for environmental categorization of projects was also presented in the workshop. The draft "Projects Categorization for initial environmental examination (IEE) and EIA in Myanmar" indicates that all road rehabilitation projects will be required to prepare an IEE regardless of project size. A check on August 2013 with the Deputy Director for Policy of MOECF's Environmental Conservation Department revealed that presently MOECF is still in the process of finalizing the draft rules based on the results of the workshop and feedbacks. MOECF cannot say when the draft EIA rules will be implemented since it is a long process before it can be approved by the government. The draft EIA rules did not specify the processing time.

3. The steps of environmental permitting process in Myanmar under the Draft Environmental Impact Assessment Rules are:

Step 1: Project proponent will prepare an IEE or EIA. Basis for determining the type of assessment document (IEE or EIA) is prescribed by the Draft Project Categorization list prepared by MOECF.

Step 2: Project proponent will submit the IEE to MOECF.

Step 3: If the IEE is approved by MOECF, it will submit all documents with comments and recommendations to the EIA Committee (EIAC).

Step 4: The EIAC will grant an environmental approval, through the issuance of a certificate of environmental approval, for implementation of the proposed project subject to any conditions as may be prescribed. The EIAC will inform other relevant agencies of the decision and publicize it in appropriate media. The certificate of environmental approval will include the duties imposed on the project proponent by virtue of the Environmental Management and Monitoring Plan.

Step 5: The project proponent may commence implementation of the project according to the conditions attached to the approval and the Environmental Management and Monitoring Plan, within the timeframe as may be prescribed by MOECF.

PHOTOGRAPHS OF SITES FOR MAUBIN-PYAPON ROAD REHABILITATION PROJECT

Photo No.1 – Starting point of the Maubin-Pyapon Road; just outside of the urbanized area of Maubin.

Photo No.2 – Road section through the town of Kyiaklat; only pavement rehabilitation and no road widening for this section

Photo No.3 – Beyond the road ROW are agricultural landscapes dominated by rice fields

Photo No.4 – Road sides are sparsely planted with trees, mostly Acacia (*Acacia auriculiformis*), an invasive tree species

Minutes of the Initial Public Consultation and Information Disclosure held at Maubin District's Meeting Room, General Administrative Department Office, 12 September 2013

A. Opening and Presentations:

1. The public consultation opened at around 10:40 AM. by U Kyaw Shein, Deputy Chief Engineer, Planning Department (Ministry of Construction [MOC]/Public Works [PW]) by welcoming the participants and encouraged them to participate actively in the meeting. He discussed the purpose of the meeting. This was followed by Daw Hla Hla Thwe, Superintending Engineer of MOC/PW Ayeyarwaddy Division who presented the details of the proposed works under the road rehabilitation project. She also encouraged the participants to participate actively and ask questions. She emphasized that the proposed project considers the importance of the area to rice production of the Ayeyarwaddy Division, citing further that improved road will provide more economic opportunities to the people and improve the convenience of traveling by land. Ye Htet Zaw, Sub-assistant Engineer (MOC/Maubin PW) presented the draft Grievance Redress Mechanism for the project and described the setting up of temporary Village Environmental Complaints Committee during the construction period.

B. Comments, Views, Issues and Concerns

2. After the presentations, the meeting immediately proceeded to questions and answers regarding the proposed project.

3. U Aung Naing, General Administrative Department of Kyiaklat, asked how MOC/PW will handle those people who illegally occupied portion of the right-of-way (ROW) of the road in the area of Kyiaklat. He also asked when the construction activities will start in his area so he can help in coordinating with other offices regarding the removal of lamp posts, telecommunication posts, and existing pavement.

4. U Kyaw Shein responded by saying that the office can take action according to the Myanmar's Road Law.

5. The Project's Resettlement Specialist, Technical Assistance (TA) Consultant, provided clarifications on the involuntary resettlement issues and the manner of handling the present obstruction within the ROW. It was further clarified that the construction activities will be within the construction limits which is much lesser in width than the ROW.

6. A farmer asked if those farmers along the road whose land will be a source for earth fill materials will be compensated. U Kyaw Shein responded by saying that MOC/PW will pay for the soil taken from those land beyond the 150 feet ROW. The farmer representative stated further that compensation should be reasonable.

7. U Than Win, member of Pyapon Parliament, expressed his request to extend the road further into the urban area of Pyapon since it is important to Pyapon and is part of the plan of the development committee.

8. At this juncture, the Project's Environment Specialist, TA Consultant, asked the participants if they have specific environmental concerns regarding the project such the disturbance and inconveniences during the construction period. It was further explained that the conduct of the initial public consultation is part of the project' requirements in compliance to ADB's Safeguard Policy Statement (2009) and the need to properly inform the public about the details of the proposed project. There were no issues raised about specific

environmental concerns and the participants further expressed their appreciation of the proposed project since it will greatly benefit them.

9. U Kyaw Shein further discussed the proposed improvements of the road to make it carry loads of up to 15 tons. He also discussed the present weakness of the road and that it requires so much repair every year.

10. U Tim Aung, representative of the forestry department, asked about the arrangement for the removal of the trees that they have planted along the road. U Kyaw Shein responded by saying that the MOC/PW and the forestry department will discuss further about this matter.

11. Daw Ah Tar Oo, representative of the Women's Affair Association, expressed her opinion that those people whose land will be used for the construction activities will be compensated for their losses. U Kyaw Shein responded by saying that of course it will be done in accordance with the law.

12. U Myint Htun, a representative of the land transportation, expressed his appreciation of the project since it will reduce the travel time and that car owners are happy to learn about the proposed project. He also suggested that road design will consider the curve between miles 5/0 to 5/1 since it is accident prone. U Kyaw Shein responded that it will be studied.

13. Toke Shwe, commander of Maubin Police Force, expressed his support for the proposed project

14. U Kyaw Soe Oo, Head of General Administration (Pyapon District), expressed his support for the proposed project and hope that it will bring more benefits to the people.

15. U Aye Thaung, Head of General Administration (Maubin District), informed the participants that the road is a main road for all southern part of Ayeyarwaddy and very useful for various sectors such as health, education, and business. He further informed that a proposed 5,000 acres of industrial zone will soon be established along the road corridor. He therefore request that the road improvement will be of good design and standards.

16. Meeting closed at 1:00 PM. The meeting was conducted in the Myanmar language.

List of Participants of Initial Public Consultation and Information Disclosure (Maubin-Pyapon Road Rehabilitation Project, 12 September 2013)

Stakeholders/Participants:

1. U Than Win, Parliament member
2. U Aung Naing, Township Office, Kyiaklat
3. U Kyaw Hla, District L.T.
4. U Than Soe Aung, District L. T
5. Toke Shwe, District commander, Maubin Police
6. U Phya Phaway, Yat Kyi Taw, Kyiaklat
7. U Myo Thant, Yat Taw Mu Pagoda, Kyiaklat
8. U Zaw Aung, Town Electric Engineer, Kyiaklat
9. U Aung Thin, Yat Taw Mu Pagoda, Kyiaklat
10. U Sein Aung Tun, Kyiaklat
11. U Tim Maung Cho, Kyiaklat
12. U Thu Ya, Township Development Committee, Kyiaklat
13. U Aung Tim, Kyiaklat
14. U Mya Aye Aung, Township Officer, Kyiaklat
15. U Tim Maung Oo, Township Officer, Kyiaklat, Dept. of Agriculture
16. U Wai Lynn, observer
17. U Myint Soe, Myanmar Red Cross Society
18. That Naing Soe, Land Record
19. U Kyaw Lin, Transport Planning Dept.
20. U Nay Myo Aung, Pyapon
21. Daw Khin Mar Myint, Assistant Director, Water Resources, Planning Dept.
22. Daw Phyu Mar Myint, Engineer, Water Resources, Planning Dept.
23. Daw Hla Hla Khet, Engineer, Ministry of Electric Power
24. Dr. Hwin Yadanar Naing, Assistant Medical Specialist, Maubin General Hospital
25. Daw Htay Htay Hlaing, Engineer, Myanmar Post and Telecom (Maubin)
26. U Soe Myint, Engineer, Myanmar Post and Telecom (Maubin)
27. U Hla Myo Myint, Engineer, Myanmar Post and Telecom (Maubin)
28. U Bo Tint, Engineer, MyanmartPost and Telecom (Maubin)
29. U Kyaw Moe Hlaing, Myanmar Post and Telecom (Maubin
30. U Chaumn Than, Reporter, Daily News
31. U Aye Thaung, General Administration, Maubin
32. U Tim Aung, Township Forest Dept.
33. U Moe Thein, Township Planning
34. U Tim Win, Staff Officer, Settlement and Land Record Dept.
35. Daw Than Nyunt, member, Women's Affair Association
36. Daw Ah Tar Oo, secretary, Women's Affair Association
37. Daw Khin Htar Yee, member, Women's Affair Association
38. Daw Soe Soe Ye, Union Solidarity and Development Party
39. U Myo Myint, District Chairman
40. *(name written in local characters)*
41. *(name written in local characters)*
42. *(name written in local characters)*
43. *(name written in local characters)*

Ministry of Construction/ Public Works:

1. U Kyaw Shein, Deputy Chief Engineer, Planning Department
2. Daw Hla Hla Thwe, Superintending Engineer
3. U Saw Kyaw Win, Assistant Engineer (Maubin)
4. Ye Htet Zaw, Sub-assistant Engineer (Maubin)
5. U Aung Myo Oo, Executive Engineer (Pyapon)
6. Daw Su Mon Kyaw, Township Engineer (Pyapon)

7. Daw Khin Tent, Township Engineer (Kyiaklatt)
8. U Ohn Maung, Engineer
9. U Tai Oo
10. U Than Hlay

TA Consultants:
1. Ruel Janolino, Environment Specialist
2. Romeo Cleto, Resettlement Specialist
3. Tara Sann, Transport Engineering Specialist

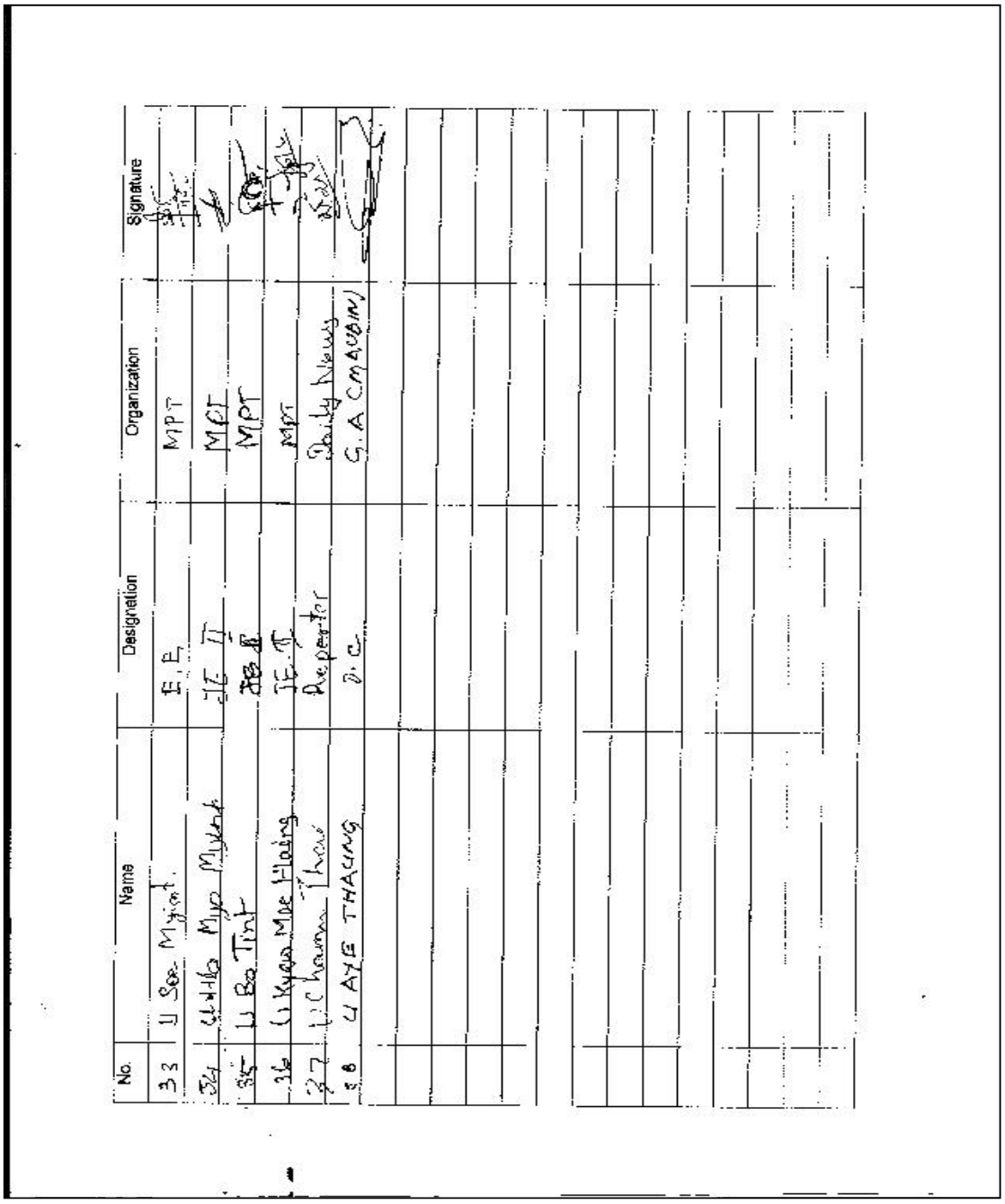
Attendance Sheet of Initial Public Consultation and Information Disclosure (Maubin-Pyapon Road Rehabilitation Project, 12 September 2013)

MAUBIN-PHYAPON ROAD REHABILITATION PROJECT; ADB TA 8251-MYA
LIST OF PUBLIC CONSULTATION PARTICIPANTS

Date: 12 September 2013 Location: Maubin

No.	Name	Designation	Organization	Signature
1	U Kyaw Shein	Deputy chief Engineer	Public work	
2	Daw Hla Hla Thwe	Specialty Engineer	Public Work (MOC)	
3	U THAN Win.		member of parliament	
4	U Aung Naing	Township Officer	G.A.D (Kyaiklatt)	
5	U Kyaw Hla.	District L.A		
6	U Than Soe Aung	District L.A		
7	Pol. Lt. Col. TOKESHWE	COMMANDER OF DISTRICT POLICE FORCE	MAUBIN DISTRICT	
8	U Phyu Phway	Yay Kyi Taw	Kyaiklat	
9	U Myo Thant	Yat Taw Mu Pagoda	Kyaiklat	
10	U Zaw Aung	Town. Ele: Engineer	Kyaiklat	
11	U Aung Thin	Yat Taw Mu Pagoda	〃	
12	U Sein Aung Than	Town Elder	〃	
13	U Tin Maung Cho		〃	
14	U THU YA	Township Development Com.	〃	
15	U Aung Tun		〃	
16	U MYA AYE AUNG	~~Township S.L.R.D~~	〃	
		Township Officer (S.L.R.D).	〃	

No.	Name	Designation	Organization	Signature
17.	Daw Khin Toint	Township Engineer Kyaiklat	Public work	
18	U Tin Maung Oo	Township officer	DOA. Kyaiklatt	
19	U Ohn Maung	Junior Engineer (1)	Public Work	
20.	U Wai Lynn	Observer.	–	
21	Daw Khin Moe Kyaw	Township Engineer, Pyapon	Public Works	
22	U Myint Swe	2 I C	M.B.C.S.	
23	That Naing Soe	Land Record Dalgoved	R.L	
24	U Kyaw Zayar Lin	Transport Planning Department	R.L	
25	U Nay Myo Aung	N L D	Pyapon.	
26	U Pai Oo.	Town ship	Public work	
27	U Than Htay	Town ship	–	
28	Daw Khin Mar Myint	Assistant Director	Planning Department	
29	Daw Phyu Mar Myint	S.AE	Directorate of water resources and improvement of river system	
30	Daw Hla Hla Khet	SAE	Ministry of Electric Power	
31.	Dr. HNIN YADANAR NAING	Assistant MS	Maubin General Hospital	
32.	Daw Htay Htay Hlaing	SAE	Maubin mobile station MPT	



No.	Name	Designation	Organization	Signature
33	U Soe Myint	E.E.	MPT	
34	Daw Khin Myo Myint	JE II	MPT	
35	U Ba Tint	AE	MPT	
36	U Kyaw Moe Hlaing	JE II	MPT	
37	U Khaung Lwin	Reporter	Daily News	
38	U AYE THAUNG	D.C.	S.A CHAUBIN	

MAUBIN-PHYAPON ROAD REHABILITATION PROJECT: ADB TA 8251-MYA
LIST OF PUBLIC CONSULTATION PARTICIPANTS

Date: 12 September 2013 Location: Maubin

No.	Name	Designation	Organization	Signature
	U Win Myint		Hluttaw	
	U Than Chaung			
	U Nyi Nyi Linn	T.O	General Administrative Department	
	U Soe Naung	Fire service officer	F.S.D.	
	U Myo Khant	Assistant Director	Department of Agriculture	
	U Kyaw Win	Immigration officer	AD- Ngo	
	U Moe Kyaw Ag	D.T.O	General administration	
	U Aung Kyaw Oo	A.E	T.D.C, Maubin	
	Aung Zaw Lwin	Township Electric Engineer	M.O.E.P	
	U Khin Mg Htwe	DOD. Da		
	U Myat Khaing	— " —		
	U San Htun	Inland Water Transport	Manager	
	U Thein Hlaing			
	U Aung Myo Oo	Executive Engineer	Phyapon District	
	U Tin Mg Soe	E.E.	T.D.C, Pyapon	
	U Myint Aung	A.E	Irrigation Department	
	U San Win	Staff officer	D.O.A	

No.	Name	Designation	Organization	Signature
	U Tin Aung.	R.O.	Township Forest Dept.	[signature]
	U Moe Thein	P.O	~~Township~~ Planning	[signature]
	U Tin Win	Staff officer	Tg. S. L R	[signature]
	Daw Than Nyunt	member	woman association	[signature]
	[illegible]	"	"	[signature]
	Daw Khin Htay Yee	member	"	[signature]
	Daw Soe Soe Ye	regional CC	USDP	[signature]
	[illegible]	[illegible]	[illegible]	[signature]
	[illegible]	[illegible]	[illegible]	[signature]
	[illegible]	[illegible]	[illegible]	[signature]
	[illegible]	[illegible]	[illegible]	[signature]
	U MYO MYINT	chairman. District		[signature]
	~~[illegible]~~	(Mauhin). D.A.C		
	RUEL J. [illegible]	CONSULTANT - ADB	ADB	[signature]
	ROMEO J. CLETO	CONSULTANT ADB	ADB	[signature]
	TARA JANN	consultant - ADB	ADB	[signature]

PHOTOGRAPHS OF INITIAL PUBLIC CONSULTATION AND INFORMATION DISCLOSURE (Maubin-Pyapon Road Rehabilitation Project)

Photo No.5: U Kyaw Shein, Deputy Chief Engineer, Ministry of Construction, welcomed the public consultation participants [12 September 2013]

Photo No.6: A stakeholders' representatives raised some points regarding the project [12 September 2013]

Photo No.7: A stakeholders' representatives raised some points regarding the project [12 September 2013]

Photo No.8: Daw Hla Hla Thwe, Superintendent Engineer, Ministry of Construction, discussed details of the proposed project [12 September 2013]

SAMPLE CONTENTS OF ENVIRONMENTAL MONITORING REPORT

Executive Summary

- Summary of Environmental Management Plan (EMP) Implementation for the 6-month period
- Key issues, corrective actions, and any grievances
- Recommendations

1.0 Background

- Profile of Proponent
- Location Information

2.0 Status of Activities

- Activities of Proponent
- Progress of Work (% physical completion)
- Changes to Surrounding Environment due to Construction Works
- Status of Approval/Permits/Consents for the Project and construction-related facilities

3.0 Details of EMP Implementation Status /Evaluation[1]

- Design/Location/Preconstruction Phase Monitoring
- Construction Phase Monitoring
- Operation Phase Monitoring
- Occupational Health Risks and Safety Plan for Workers
- Redress of Grievances (type of grievance, date, persons, etc.)
- Required Corrective Actions[2]
- Status of Implementation Previous Required Corrective Actions
- Field Visits and Consultations (sites visited, dates, persons met)
- Training (Nature/scope of training, number of participants, date, venue, etc.)

4.0 Conclusion

- Important/significant findings of the monitoring
- Recommendations to improve environmental management and monitoring

Appendices

- Approvals/Consents/permits
- Monitoring data
- Photographs
- Maps/plans
- Documentation related to training conduced (scope, training manual, attendance sheets, photographs, etc.)
- Documentation related to receipt of complaints and actions taken

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[1] Environmental monitoring will be undertaken to assess level of compliance with each mitigation measure specified in the Project EMP/CEMP over the 6-month period. Assessment of compliance could be presented in tabulated form by presenting each mitigation measure, corresponding level of compliance (Yes, No, Partial), and remarks explaining why compliance level is “No” or “Partial”.

[2] The corrective actions should be presented in matrix form with the following details: (i) identified non-compliance/environmental issue, (ii) specific location, (iii) required action, (iv) responsibility for implementation of required action, (iv) target date of implementation.