Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plan (ESMP) for Subproject 1, Environmental and Social Assessment (ESA) for Stretch 1, and ESMP Monitoring and Reporting during Construction of Subproject 1

ESMP FOR BANK PROTECTION COMPONENT

PREPARED FOR: DIRECTORATE OF WATER RESOURCES AND IMPROVEMENT OF RIVER SYSTEMS
PREPARED BY: ICEM ASIA
JANUARY 2018
## ABBREVIATIONS

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<thead>
<tr>
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<th>Description</th>
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<tr>
<td>ADPA</td>
<td>Ayeyarwady Dolphin Protected Area</td>
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<tr>
<td>BOD</td>
<td>Biological Oxygen Demand</td>
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<tr>
<td>BTNMT</td>
<td>Ministry of Natural Resources and Environment of Vietnam</td>
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<td>DALMS</td>
<td>Department of Agricultural Land Management and Statistics</td>
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<tr>
<td>DO</td>
<td>Dissolved Oxygen</td>
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<td>DWIR</td>
<td>Directorate of Water Resources and Improvement of River Systems</td>
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<tr>
<td>DWT</td>
<td>Dead Weight Tonne</td>
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<tr>
<td>E&amp;S</td>
<td>Environmental and Social</td>
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<td>EIA</td>
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<td>ESMP</td>
<td>Environmental and Social Management Plan</td>
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<td>ICEM</td>
<td>International Centre for Environmental Management</td>
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<tr>
<td>LAD</td>
<td>Least Available Depth</td>
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<td>MCA</td>
<td>Multi-Criteria Analysis</td>
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<td>MRC</td>
<td>Mekong River Commission</td>
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<td>OPIC</td>
<td>On-site Project Implementation Committee</td>
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<td>PMU</td>
<td>Project Management Unit</td>
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<tr>
<td>QCVN</td>
<td>Vietnam National Technical Regulations</td>
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<tr>
<td>RHDHV</td>
<td>Royal HaskoningDHV</td>
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<tr>
<td>USD</td>
<td>United States dollar</td>
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<td>WHO</td>
<td>World Health Organisation</td>
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1 PURPOSE OF THE ESMP FOR BANK PROTECTION

This Environmental and Social Management Plan (ESMP) is prepared as a stand-alone document for the Bank Protection Measures component of the Subproject 1. A simplified version of this ESMP is included as a sub-section of the ESIA for Subproject 1, along with the draft ESMPs for the Porcupines and Dredging components of Subproject 1.

The preparation of the ESMP for Bank Protection separately from the overall ESIA for Subproject 1 is driven mainly by the need to allow for construction of bank protection measures in February 2018 as the other porcupines and dredging components under Subproject 1 will be implemented in the next dry season (2018/19). The rationale is as follows:

- Suitable conditions for the type of constructions planned in Subproject 1 are limited only to dry season, and therefore not all the envisaged river training measures can be implemented within the upcoming dry season (February - March 2018);
- The bank protection is a necessary mitigation measure to prevent riverbank erosion prior to installing the roughness measures (porcupines). Therefore, there is urgent need to implement the bank protection component during the upcoming dry season, while the porcupines will be constructed during the next dry season (2018/19);
- The bank protection is also a primary concern of the local community, whose agricultural land is vulnerable to bank erosion. Implementing bank protection measures during the next dry season, before the high-water period when bank erosion accelerates will prevent further loss of community’s agriculture land and protect people’s land and livelihoods;
- To minimise environmental and social impacts it is also recommended that the concrete piles needed for the porcupines are pre-fabricated at a cement factory or construction yard, this work can commence in July 2018;

Disclosure and consultation of this ESMP comprised the following key steps:

- December 28-29: The team and PMU visited the villages of Kyun Sin and Ta Laing Zin near the proposed bank protection structures on 27-28 December 2017 to determine number of project affected persons (PAPs) and discuss the bank protection works.
- January 9 2017: Executive Summary of ESIA for Subproject 1 (English and Myanmar) uploaded to AIRBM (www.airbm.org)
- January 10 & 17 2017: Land donation forms were signed by 7 farmers in Kyun Sin village and 10 farmers in Ta Laing Zin village to donate a % of alluvial agricultural land to the State (in accordance with Farmland 2012 Law). Representatives from Seta, Hin Ywet Su and Naung Pinthar villages signed the land donation forms to donate a % of vacant land to the State.
- January 18 2017: Public consultation on the Draft ESIA for Subproject 1 and ESMP for Bank Protection was conducted.

2 PROJECT CONTEXT AND RATIONALE

The overall objectives of Subproject 1 are to achieve a Least Available Depth (LAD) of 2.0 m for a design of 1,000 dead weight tonne (DWT). The river training works and dredging will allow vessels to
pass more heavily loaded during dry season, increasing the efficiency of passenger and cargo transport. The project will:

- contribute to the year-round and safe accessibility to the Mandalay Port Area;
- contribute to the stabilization and deepening of the main navigation channel (Mandalay channel) in selected area (km 887 - 909) by natural bed erosion and capital dredging for most critical locations; and
- reduce possible future scenarios that the navigation channel shifts to one of the side channels (e.g. Sagaing channel).

The process to assess the project alternatives and select the river training measures for Subproject 1 has been an iterative process that has involved ongoing stakeholder engagement and collaboration between ICEM, RHDHV, PMU/DWIR and the World Bank. A Multi-Criteria Analysis (MCA) process was implemented from June to August 2017 to select the most cost effective and sustainable design options for Subproject 1. Environmental and Social (E&S) criteria was designed to assess several combinations of river training structures and dredging in both the upstream and downstream areas.

Following the MCA and preliminary design process a combination of hydraulic roughness measures (concrete porcupines) and dredging were selected to meet the project objectives. The fields of concrete porcupines in and along the secondary channels were selected as the main intervention to prevent a shift of the main channel to the Sagaing channel. Porcupines are permeable structures designed to reduce flow and to trap sediment. During the detailed design phase, it was recommended by RHDHV that additional bank protection which aligns with the porcupine fields is needed to prevent or reduce bank erosion happening at present in the area. A rip-rap armour stone protection is proposed. This is a basic, well known solution, that is suitable in combination with porcupines were the porcupines are placed on top of the protection. Subproject 1 now comprises the following three components (Figure 1):

1. Bank protection - construction envisaged to start February 2018;
2. Roughness measures (porcupine fields) - installation envisaged next dry season (December 2018 to April 2019); and
3. Dredging program - no large-scale dredging required this dry season (2017/18).
2.1 Bank protection component

The requirement for bed and bank protection is detailed in the RHDHV Preliminary Design Report (v3) and Detailed Design Report (December 2017). The proposed roughness measures (porcupines) in the side channels and on the islands adjust the flow velocity and sediment transport capacity in the side channels. Although the roughness measures reduce the discharge to the side channels and
the flow velocity on the islands, both local flow acceleration and a downstream increase in sediment transport capacity may occur. Local flow acceleration near the banks might cause, or accelerate, local bank erosion, whereas a downstream increase in sediment transport capacity might cause bed erosion.

Local communities in the Subproject 1 area are very supportive of bank protection works as erosion was emphasized as a significant issue affecting land and agriculture throughout the series of stakeholder consultations. The agricultural land on the island area is changing every year due to riverbank erosion and is classified as alluvial soil. The government cannot issue land use certificates for alluvial soil land so instead the farmers must pay tax for growing crops on the alluvial soils. A GIS field mission was undertaken in May 2017 by ICEM to map the erosion risks in the Subproject 1 area. During surveys in October/November 2017 it appeared that local erosion had also occurred at other locations along the island.

Figure 2 below presents the most important and obvious locations that were observed in May 2017.

Figure 2: Location of bank protection and existing erosion risks
A rip-rap armour stone protection is proposed for which the bank must be re-profiled to a gentle 1:2.5 slope with a toe at MSL+60m or higher, depending on the local bathymetry. That can, in some areas with existing steep erosion-affected banks (e.g. some bank sections north of the Kyun Sin village), represent an encroachment to the existing plain surface of the islands up to around 30 meters from the wet area of the channel. In most of the area however, a comparatively smaller modification will be required to obtain the desired slope, i.e. thanks to the naturally developed mild slope or previous bank-protection works (e.g. along the bank in the vicinity of the Kyun Sin village). The Bank protection will be a combination of (Figure 3):

- Rock protection on geotextile above MSL+63m;
- Facine mattress for the wet part of the bank and toe to install bank protection under water; and
- Above MSL+67m vetiver grass.

Figure 3: Example of design for bank protection (Source: RHDHV)

The first set of bank protection works will be installed along the Sagaing channel and the construction area is proposed on the sandbar adjacent to the bank protection to limit the impacts on alluvial agricultural land and riparian vegetation. A construction camp or facilities will also be established in this area. An existing unpaved road from Ta Laing Zin village will be used as the access road to transport the stones, materials and workers to the construction area which is accessible by the small truck and tractor. The suitability of the access road will need to be assessed by the contractor as it may need to be levelled by top dressing (i.e. gravel) to ensure more efficient transport of construction materials to the site. The road condition will be assessed in detail prior to the installation of porcupines (planned for December 2018 to April 2019) to determine any additional measures to allow the trucks to access the site more efficiently. The second bank protection works will be constructed along the middle channel. The materials will be transported by boat to a sandbar at the north of the island and transported manually or by small tractor/trailer to the construction area (Figure 4). The construction area and facilities for construction workers will be established just north of the proposed bank protection works.
2.2 Objectives of the ESIA and ESMP

The objectives contribute to the overall and development goals under the larger context for the AIRBMP and promote EIA procedures in Myanmar. The specific objectives of the ESIA and ESMP are presented below in Table 1.

Table 1: Specific objectives of the ESIA and ESMP

<table>
<thead>
<tr>
<th>Process</th>
<th>Objectives</th>
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| ESIA    | The preparation of an ESIA for the design alternatives proposed by RHDHV for river training structures and dredging for Subproject 1  
  i. effectively identify environmental and social impacts  
  ii. ensure an integrated decision-making process wherein environmental and social impacts are identified, and possible adverse effects can be avoided and/or minimized |
Process | Objectives
--- | ---
iii. inform and consult with the public concerning the ongoing projects and their potential impacts on the environment and social systems  
iv. promote sustainable use and conservation of the natural resources and ecosystems in the Subproject 1 area.

**ESMP**  
Preparing, monitoring and reporting on an ESMP for Subproject 1 to:  
i. define measures which avoid and mitigate negative impacts and enhance benefits of the proposed developments  
ii. guide the ongoing process of monitoring and reporting on implementation of Subproject 1  
iii. enhance the benefits of use and conservation of the natural resources and ecosystems in the project area  
v. help to manage and mitigate environmental and social impacts.

The main outputs for each part are:

- **Part A (i):** ESIA for Subproject 1  
- **Part A (ii):**  
  - ESMP for Bank Protection  
  - Draft ESMP for Roughness Measures (Porcupines)  
  - Draft ESMP for Dredging Program

The legal basis for conducting an ESIA in Myanmar is provided by the Environmental Conservation Law (2012) and the subsequent provisions under the Environmental Conservation Rules (2014) and the EIA Procedures (2015).

The combination of bank protection and roughness measures (porcupines) in the Sagaing and middle channels and the estimated volume of dredging in the upstream and downstream area in the next dry season (2018/19) is expected to be less than 500,000 tons (270,000m³) and is not likely to trigger an EIA under the Myanmar EIA procedures (2015). Subproject 1 was approved to prepare IEE from ECD with the letter no. 026/2018 on 9th January 2018.

The World Bank also screens all projects and classifies them into one of four categories (Category A, B, C, and FI). Subproject 1 has been classified as a Category B which is generally similar with IEE (Initial Environmental Examination) required under Myanmar EIA procedures (2015). The ESIA for the Subproject 1 and ESMPs will be prepared in compliance with the Myanmar Environmental Impact Assessment (EIA) Procedures (2015) and applicable WB safeguard policies.

### 3 SUMMARY OF ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

The ESIA for Subproject 1 includes comprehensive information on the environmental and social baseline conditions in the Subproject 1 area and outlines the assessment methodology and stakeholder consultation carried out during implementation. The assessment methodology was designed around the following key themes:

1. Water quality and baseline sampling;  
2. Fisheries and Biodiversity;  

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²Environmental Conservation Rules, Notification No. 50/2014
3. Geomorphology and hydrology; and
4. Social and livelihoods.

The following sections provides a brief overview of the key findings related to each theme.

### 3.1 Water quality and baseline sampling

Baseline sampling was undertaken during both the dry and monsoon seasons. From 28 April 2017 to 3rd May 2017 ICEM and local partner EMC conducted the following monitoring:

- Air quality - 2 samples
- Groundwater - 2 samples
- Sediment - 2 samples
- Soil - 2 samples
- Surface water quality - 5 samples

A number of parameters were monitored for groundwater, sediment, soil, surface water and groundwater which are described this report. It was agreed during the scoping phase that wet season surface water quality sampling would also be conducted on 25 & 26 September 2017. In the absence of Myanmar water quality standards or guidelines, the World Health Organization (WHO) and Vietnamese technical standards and Mekong River Commission (MRC) were used for comparison. The results are summarized below:

- **Air quality:** All the parameters for the air quality standards are within the WHO’s standards, for both 24 hour and 1 hour time frames.
- **Groundwater:** The following parameters do not meet the QCVN 08:2008 & 2015 / BTNMT standards: Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Total Hardness and Iron.
- **Sediment:** The second sample had a small concentration of arsenic, heavy metal (lead and chromium) was higher in upstream sample when compared to the downstream and mercury values in both samples high, but within the standards for Mekong Lowland Rivers.

From stakeholder consultations, it was found that the people who do use the Ayeyarwady River as a source for drinking water, only use it during the dry season. During the wet season rain water is harvested. Most of the communities use a dug well with sand filter as their main drinking water source. By comparing the monitored parameters to the standards no significant or worrying values where found that would do harm to the public or aquatic life for all parameters of the air, sediment, surface and groundwater parameters.

### 3.2 Biodiversity and fisheries

Two field visits were made, one in the dry and one on the wet seasons of 2017. During the dry season field visit, fish species composition at the proposed project area was examined. The record and collection were made with the help of the local fishers. The fishes were collected using different fishing gears available at the proposed project sites like gill nets, cast nets, beach seine nets and various traps. The fish were photographed and basic characteristics were recorded for identification. The aquatic habitats in the study area can be defined in terms of the seasonality of inundation by the river flood waters:

1. **Main channel** - permanent flowing water with channel depth up to 20 m;
2. **Side channels** - permanent water, flowing in the wet season, with flows decreasing to nil in the dry season and becoming lakes. Depth of the lakes in the dry season may be up to 5 m deep; and
3. **Seasonally inundated land on islands and riverbanks.**
Inundation of low lying areas lasts for up to six months from May to October. These areas may have reeds and grasses surrounding them e.g. in the northern end of the island, or may dry to form sandbanks e.g. in the channels or at the southern end of the island.

Inundation of higher lying areas lasts for a few weeks in July/August e.g. near the villages. These will generally be used or agriculture.

In most of the villages there are relatively few full-time fishing households, although most villagers will catch fish for subsistence purposes. Within the project area, there are 34 villages, with a total population of 46,599 and 289 fishermen. Nine of these villages, with about 8,647 people of which about 40-50 are full-time fishermen are located on the islands. A total of 37 fish species were recorded during the dry season survey and an additional 17 species were recognized by fishermen as part of their catches during the wet season field visit. These have been compared with the species list prepared from Nwe Nwe Thein’s PhD thesis, which includes the study area. These species lists have been consolidated giving a total of 70 fish species found in the area.

May and June are breeding seasons for fishes. September to November is the peak season for fish catch, with an average yield of 7-8 viss (11.5 - 13.1 kg) of fish per day. It is noted that yield of catfish and striped catfish has declined over the last 10 years. From discussions with fishermen, it is generally perceived that the amount of fish being caught each day has decreased.

The Ayeyarwady Dolphin Protected Area (ADPA) is located just upstream of the proposed project area starting from Mingun area (downstream end) to Bahmo city (upstream end). Two Ayeyarwady dolphins (Orcaella brevirostris) (Owen in Gray, 1866) were observed at Mingun, which is upstream of the proposed project area. According to the interview survey of local villagers and fishermen, Ayeyarwady dolphins visit the main channel of the river during monsoon season. The Mandalay Fisheries Department carry out dolphin counts in the ADPA two times per month. Recent counts indicate that there are between 61-70 dolphins in this area. During the wet season field visit, villagers in Ko Daung mentioned that the body of a pregnant female dolphin had been recovered in the study area at the end of the dry season 2017.

As a seasonally flooded wetland area with side channels and permanent bodies of open water, the study area is attractive to water birds and migratory and congregatory species, such as geese and ducks. Permanent resident water birds observed during the wet season survey include Pied kingfisher, great and little egrets, pond heron, grey heron, purple heron, green bee-eater and ruddy shelduck. They are usually found on the inlets and reed bed areas to the north of the island complex, on the sandbars and around the open bodies of water. Asiatic soft-shell turtles Amyda cartilagineawere reported by fishers to have been in the study area. The villagers from Ngaung Bin Tha village reported that turtles have been seen in the past on the sandbars near the small channel near Ngaung Bin Tha in March and April, but these sightings are rare, and the nesting areas are unknown. No turtles were observed during the field missions.

3.3 Hydrology and geomorphology

In the following sections the hydrological system is presented. The key trends and the sensitivity of the hydrology is discussed at the end of this section.

3.3.1 Hydrograph

Subproject 1 Area is located at Mandalay and Sagaing in the Ayeyarwady River. At Sagaing, the basin area is 120,193 km² and the annual mean flow is about 240 $10^9$ m³. Variation between high and low water level is great. Because of the monsoonal character of the seasons, the highest point in discharge is generally recorded in August and the lowest in February. An annual averaged flow of 7,630 m³/s is measured at Sagaing gauging station, with an average base flow of around 2,000 m³/s and an averaged high flow of 18,000 m³/s. A hydrograph for Sagaing is shown in Figure 5.
3.3.2 Flow Distribution

At the upstream end of Subproject Area 1 the Ayeyarwady bifurcates into three channels, viz. the Mandalay Channel (eastern channel), the Sagaing Channel (western channel) and the Mid Channel. From all available satellite images it appears that the Mandalay Channel exceeds the other channels in size, but there appears to be a significant variation over time in size of both the Sagaing and Mid Channels, see Figure 5. During high flows the islands separating the channels are flooded (Figure 7).

Figure 6: Dry-season (January) satellite images of Subproject 1 area. From left to right: 1990, 1998 and 2017.
Referring to Figure 6 it appears that in the current (2017) condition the secondary (Sagaing and Mid) channels are less significant than earlier. Model simulations presented by RHDHV suggest that about 58.6 to 62.2% of the discharge flows through the Mandalay channel.

3.3.3 Geomorphology

The morphology of Subproject 1 Area is highly dynamic and complex. From inspection of satellite images it seems however that certain features are remarkable stable, while other features seem to be more short-lived (see Figure 8).

- Upstream of Mingun, the right bank is made of hard non-erodible material. At part of this section, the deep channel is consistently attracted to the non-erodible bank whereas the deep channel fluctuates from the right to the left bank further upstream. The deep channel meanders within the river belt and contribute to making the Mandalay channel dominant.
- Further downstream at Sagaing, the river width seems to be confined by rocky outcrops at both right and left bank.
- In the middle reach of Subproject 1 Area (opposite Mandalay) the channel along the right bank seems to have a lifecycle where it grows to an almost similar size as the channel at Mandalay followed by a decline.

It is difficult to determine the factors controlling the cyclic behavior of this channel pattern. It is, however, important to understand that most of the braid belt is submerged during high flows (see Figure 4 above) and that enormous quantities of sediment are being transported through the river during the annual floods, with huge potential for erosion and deposition of the channels, bars, islands and riverbanks. After each flood season, the channels, bars, islands and riverbanks are thus left in a different location than they were before. To quantify this dynamic behavior and analyses of recent LANDSAT 7/8 images from February 2014 through 2017 were made. From the images shapefiles representing the extent of the water bodies have been extracted. Combining the
shapefiles from each of the four years the dynamics of sand bars, bank lines and islands become visible. The shapefiles overlaid the February 2017 satellite images are shown below in Figure 8, where also areas subjected to bank erosion are indicated.

Figure 8: Analysis of geomorphological changes from Feb 2014-17 (Landstat 7/8)
The figure shows that large sand bars are migrating through the river and in particular through the Mandalay Channel. The migration speed is locally up to 500 m per year but generally of the order of magnitude 100 m per year. These sand bars are affecting navigability. The sand bars also may hamper access to the river for villagers, berths and landing facilities may not be accessible and it may render irrigation intakes inoperable during low flow.

The bank erosion (risk) indicated above is based on visual inspection of the river banks during a boat trip in the area. Generally, steep banks have been interpreted as a sign of bank erosion. Bank erosion is reported to be a key concern in the present situation. For instance, in the stakeholder consultations at township level river bank erosion surfaced as the major river related issue for all five of the townships consulted. The key issue related to bank erosion is loss of fertile agricultural land and erosion of pertinent infrastructure at the river banks. Two mechanisms seem to be responsible for bank erosion:

- The characteristic spiral (helical) flow in rivers bends causes the river to depend and attract flow along the outer bend. The higher flow velocities and larger depth cause the outer bend to erode.
- Where a sand bar is formed along one bank (or detached from the bank) the flow is deflected towards the other bank and give rise to bank erosion.

### 3.4 Social and livelihoods

The initial social field research revealed that there are nine village tracts in the Subproject 1 area on the west bank (Sagaing), on island and east bank (Mandalay) (Figure 9). The villages in this area use the river and the Sagaing and middle channels for domestic and agricultural uses, local boat transport, fishing and are experiencing loss of agricultural land from riverbank erosion.

**Figure 9: Village tracts in Subproject 1 area**
Field research for the social and livelihoods theme was carried out throughout implementation with two major missions taking in place from May 2-8th 2017 prior to the MCA process and then again October 30th to November 2nd after the preliminary design workshop. The second fieldwork focussed on Kyun Sin village on the island and the area from Let Pan village North on the Sagaing side. These villages are nearer to the location of the proposed bank protection and roughness measures (porcupines). The main findings in relation to local communities living in the area are summarised below.

- **Livelihoods**: The income of most households in the study villages on the island is from agriculture and livestock. It was reported that in general incomes have decreased due to erosion and loss of farmland on the riverbanks. Other economic activities are handicrafts such as sewing, weaving and making traditional cigars, sand extraction, and small-scale trade. Some women work as vendors and sell the snacks at their village. Others are daily workers making traditional cigarettes or are yellow-robe tailors.

- **Water use**: On the island, the villages Kyun Sin and Gyaint Gyi have tube-wells, but according to verbal information they use the river as drinking water source. In the dry season, Lat Pan village tracts use water from the secondary river channel for irrigating the garden.

- **Land use**: Probably the most important land use category in the present context is the agricultural land on the floodplains on the riverbanks and on the island, so-called alluvial lands. The fertile sediment lands are dynamic and sensitive to changes in river flows. According to information from the villages, the study area has a total of 2,654 hectares of riverbank and island gardens and fields, of which 656 hectares are on the island.

- **Land tenure**: According to Department of Agricultural Land Management and Statistics (DALMS), Patheingyi Township, the agricultural land in the villages Than Bo Gyun, Hin Ywet Su, Gyaint Gyi, Po Hla Gone and Kyun Sin are alluvial flood plains. This type of land is being regarded as the unstable due to bank erosion and reconfigures the land while it is submerged under water, which alters soil texture and structure during the peak flow period. Hence, according to Farmland Law (2012) legal ownership cannot be given and farmland certificate (form-7) cannot be issued for such areas. However, the Township Administrative Department issues a tax receipt to each farmer who are charged for land use. In both Kyun Sin and Let Pan village farmers have tax receipts for their cultivated land. The tax amount is 2 Kyat 70 Pyar per acre.

- **Local boat transport**: The study collected details about the present means of transport on the river and on land, with a view to assess potential impacts from the proposed navigation enhancements, on access to services, markets, work places and education. Information on the number of households that owns boats and the existing ferry services in terms of license holders, passengers and cargo was collected. The village profiles report on the importance of boats for river transport especially in the monsoon season. On the island and in the study villages on the Mandalay side, nearly all households have a boat, which is used during the monsoon, while on the Sagaing side only few households have boats.

**Kyae Yar Taung Stupa**: On the Sagaing side in Ta Laing Zin village north of Let Pan there is the Kyae Yar Taung Stupa and Kyae Yar Taung Shwe Thein Taw (Ordination Hall). It is situated on the river bank above the proposed site of the western-most narrow porcupine field. The stupa is a holy place for community worship. The ordination hall (Sima) is a special religious building for ordination into monkhood and it is an exalted place for Buddhists.

**River bank erosion and flooding**: Over the years many people along the Ayeyarwady have lost their livelihood due to flooding and river bank erosion. The study area is equally prone to erosion and flooding. People in Kyun Sin and Gyaint Gyi are worried about riverbank erosion. They have
experienced river bank collapse many times over the past 30 years and the two villages were seriously damaged between 2013 and 2016. Kyun Sin lost one fourth of its total land between 2006-2016 and Gyaint Gyi village has been moved to a new location four times over the years.

4 SUMMARY OF ADVERSE IMPACTS

According to the conducted assessment, the Bank Protection component of the Subproject 1 is not associated with any significant negative environmental or social impacts. The identified potential adverse impacts and risks are mostly of a temporary nature and can be mitigated through application of ESMP measures specified in section 5 below. The following adverse impacts related to the implementation of the Bank protection measures were identified in the Draft ESIA report:

<table>
<thead>
<tr>
<th>Impact</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect impacts of construction materials sourcing (indicative 20,347 tons of hard rock)</td>
<td>Negligible to moderate</td>
</tr>
<tr>
<td>Loss of agricultural land due to bank slope modification;</td>
<td>Moderate</td>
</tr>
<tr>
<td>Temporary impacts on water quality, aquatic ecosystems, and fisheries due to construction-related sediment mobilization;</td>
<td>Negligible to moderate</td>
</tr>
<tr>
<td>Risk of water and soil contamination from wastes, and accidental pollution by fuels, and other hazardous substances;</td>
<td>Negligible to moderate</td>
</tr>
<tr>
<td>Temporary disturbance to wildlife and habitats due to the presence of workforce and construction operations on the site;</td>
<td>Negligible to moderate</td>
</tr>
<tr>
<td>Risk of conflict with local communities and security issues due to presence of circa 100-120 workers and their temporary on-site accommodation</td>
<td>Negligible to moderate</td>
</tr>
<tr>
<td>Impacts on ambient environmental quality (air pollution and noise emissions) due to increased road transport, construction works and operation of machinery.</td>
<td>Negligible to moderate</td>
</tr>
</tbody>
</table>

The small loss of agriculture land due to bank modification works is the only identified permanent adverse effect. The PAPs in the area are concerned about riverbank erosion in the area and agreed to a land donation which is detailed in the Abbreviated Resettlement Action Plan (ARAP)- see section 6. This will however be offset by the positive bank protection effect, i.e. prevention of further agricultural soil loss due to natural bank erosion of cultivated alluvial land. Since the bank protection measures are to be developed only on slopes exposed to the bank erosion (where alluvial land is already being removed by erosion), their construction will not have any side-effect in terms of prevention of further alluvial land formation elsewhere. The adverse impacts were identified through a series of stakeholder consultations and joint field trips/technical meetings between ICEM, RHDHV, PMU/DWIR and WB. This ESMP sets out the mitigation measures required to address and manage these impacts, and also provides recommendations for future monitoring.

5 MANAGEMENT OF ENVIRONMENTAL AND SOCIAL IMPACTS

5.1 Overview of mitigation measures

For every key concern, adverse impact or risk identified in the ESIA a specific mitigation and/or enhancement measure is proposed. A summary of the key general mitigation measures is provided below in Table 2.

A detailed overview of specific mitigation actions including responsibilities, time of implementation, monitoring methods, and performance indicators are presented in the Mitigation Management and Monitoring Matrix (Table 2).
Table 2: Summary of key general mitigation measures

<table>
<thead>
<tr>
<th>Concern</th>
<th>Mitigation/enhancement:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concern:</strong> Indirect impacts of construction materials sourcing (detailed design report estimated 20,347 tons of hard rock for construction)</td>
<td><strong>Mitigation/enhancement:</strong> PMU/DWIR shall ensure that: Before awarded the contract, each supplier ensure that the construction rock material is obtained from quarries operating in compliance with applicable environmental standards. This shall be ensured either through: 1) Supplier producing the written confirmation from the responsible (environmental) authority that the quarry facility operates legally and complies with conditions stipulated in its permit, or 2) DWIR Environmental and Social Safeguards staff own inspection of the respective site(s) to assess the sustainability of the quarry social and environmental practices.</td>
</tr>
<tr>
<td><strong>Concern:</strong> Compensation in connection with the loss of agriculture land</td>
<td><strong>Mitigation/enhancement:</strong> The indicated small permanent loss of cultivated alluvial land will not be subject of compensation as the local farmers do not have legal ownership titles to these rapidly changing lands. Neither they use the respective land on permanent basis, as it is subject of periodical redistribution within the community. The one-time loss of crops associated with the construction impacts on the cultivated land will be subject of compensation. PMU/DWIR shall ensure that: Compensation for the loss of crops to individual farmers is carried out according to the Abbreviated Resettlement Action Plan (ARAP). The draft ARAP document is prepared through a dedicated process and its final version will be included as a separate document to the ESIA/ESMP.</td>
</tr>
<tr>
<td><strong>Concern:</strong> Temporary impacts on water quality, aquatic ecosystems, and fisheries due to construction-related sediment mobilization</td>
<td><strong>Mitigation/enhancement:</strong> Environmental Code of Practices application during the construction operations will be adopted by the Contractor. The Environmental Code of Practices is attached below as Appendix. The loss of income from fisheries associated with the temporary construction impacts on fish-farm located in the mouth of the middle-channel will be subject of compensation. PMU/DWIR shall ensure that: Application of the Environmental Code of Practices is included in the contract and technical documentation followed by the contractor. Regular supervision of application of the Environmental Code of Practices during the project</td>
</tr>
</tbody>
</table>
implementation is carried out.

Compensation for the loss of income to the individual fish-farm owner is carried out according to the Abbreviated Resettlement Action Plan (ARAP). The draft ARAP document is prepared through a dedicated process and its final version will be included as a separate document to the ESIA/ESMP.

**Concern:**

- Risk of conflict with local communities and security issues due to presence of workers and their temporary on-site accommodation

**Mitigation/enhancement:**

Social, Health and Safety Code of Practices followed during the construction operations will be adopted by the Contractor. The Social, Health and Safety of Practices is attached as Appendix

PMU/DWIR shall ensure that:

Application of the Social, Health and Safety of Practices is included in the contract and technical documentation followed by the contractor.

Regular supervision of application of the Social, Health and Safety of Practices during the project implementation is carried out.

Tender documents must specify that local people will be guaranteed to be offered employment first and given preference.

On-site Project Implementation Committee (OPIC) established with Village Leaders, local representatives, Department of Labour, Police, work crew managers and foremen is established to facilitate consultation on any issues of concern prior to and during construction.
<table>
<thead>
<tr>
<th>Aspect</th>
<th>Mitigation action</th>
<th>Responsible</th>
<th>Implementation timeframe</th>
<th>Monitoring methods</th>
<th>Performance indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction preparation</td>
<td>Inform adjacent residents and business owners, namely in construction sites adjacent communities (Kyun Sin, Let Pan, Gyaint Gyi, Da Ma Kya, Nyang Bin Thar communities), about completed and planned construction activities, including anticipated construction traffic.</td>
<td>Contractor, in consultation with PMU/DWIR</td>
<td>Before the commencement of and throughout the construction period</td>
<td>Feedback from OPIC</td>
<td>Record of meetings, notifications and/or interactions</td>
</tr>
<tr>
<td></td>
<td>Undertake induction and awareness training to ensure that all staff are aware of Environmental Code of Practices and Social, Health and Safety Code of Practices and the stipulations of the related management plans, particularly:</td>
<td>Contractor and all sub-contractors in cooperation with PMU/DWIR and Environmental and Social Consultant</td>
<td>Regularly, throughout construction</td>
<td>Keep a record of attendance at all training sessions</td>
<td>Training records of attendance at all training sessions</td>
</tr>
<tr>
<td></td>
<td>- Waste management</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>- Fuels and Hazardous materials management</td>
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<tr>
<td></td>
<td>- Protection of local ecosystems (including on sand bars, banks and island areas with vegetation cover, and aquatic habitats)</td>
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</tr>
<tr>
<td></td>
<td>Each construction rock supplier must produce the list of material supplied together with evidence it is acquired from the legally operating quarry complying with environmental standards. This shall be ensured either through:</td>
<td>Contractor, in consultation with PMU/DWIR</td>
<td>Before commencement of construction</td>
<td>Verification of the contract documentation</td>
<td>Record of supplied rock from approved sources</td>
</tr>
<tr>
<td></td>
<td>1) Supplier producing the written confirmation from the responsible (environmental) authority that the quarry facility operates legally and complies with conditions stipulated in its permit, or</td>
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</tr>
<tr>
<td></td>
<td>2) DWIR Environmental and Social Safeguards staff own inspection of the respective site(s) to assess the sustainability of the quarry social and environmental practices.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction site</td>
<td>Detailed layout plan for the development of the construction camp showing its location and the relative locations of all temporary buildings and facilities, including access roads. If the existing road to be used for transportation of material requires widening and/or sealing with gravel to meet Constructor’s needs, the detailed description of the planned road upgrade works must be enclosed.</td>
<td>Contractor prepares for PMU/DWIR approval</td>
<td>Before commencement of construction</td>
<td>Review site layout</td>
<td>Suitable distance to prevent water contamination and disturbance to local communities. Access road</td>
</tr>
<tr>
<td>Aspect</td>
<td>ID</td>
<td>Mitigation action</td>
<td>Responsible</td>
<td>Implementation timeframe</td>
<td>Monitoring methods</td>
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<tr>
<td></td>
<td></td>
<td>Permission of the land owner must be secured prior setting up construction camp and related facilities.</td>
<td>Contractor</td>
<td>Before commencement of construction</td>
<td>Verification of the contract (between Contractor and land-owner) or other adequate documentation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide appropriate security and enclosures to prevent unauthorized entry into the construction camp area.</td>
<td>Contractor</td>
<td>Throughout construction</td>
<td>Occasional visual inspection Record of security incidents or issues</td>
</tr>
</tbody>
</table>
|                |    | • Keep construction sites tidy and all activities, material and machinery contained within an area that is as small as possible.  
• Waste management plan implemented  
• Avoid washing of vehicles and machinery near the channels or water resources.  | Contractor  | Regularly, throughout construction | Weekly visual inspection of areas surrounding construction site | Neat, uncontaminated site                                                                                                                                                                                                 |
| Hazardous materials |    | • Locate hazardous material storage facilities, especially fuel storage, as far as practically possible from river channels or other water resources  
• Ensure that contaminants (including cement) are not placed directly on the ground (e.g. mix cement on plastic or metal sheeting). | Contractor  | Throughout construction   | Weekly visual inspection of hazardous materials handling and storage areas | Number of incidents of non-compliance  
Number of spills of hazardous materials  
Cost of cleaning up spills  
Evidence of contamination |
<table>
<thead>
<tr>
<th>Aspect</th>
<th>ID</th>
<th>Mitigation action</th>
<th>Responsible</th>
<th>Implementation timeframe</th>
<th>Monitoring methods</th>
<th>Performance indicators</th>
</tr>
</thead>
</table>
| Transport and refueling      |         | • Undertake regular maintenance of vehicles and machinery to identify and repair minor leaks and prevent equipment failures.  
  • Ensure that boats and barges do not release pollutants into the water and have adequate mooring or anchoring facilities (namely for material delivery to the northern tip of the island to supply Eastern channel bank protection works).  
  • Undertake any on-site refuelling and maintenance of vehicles/machinery in designated areas. Line these areas with an impermeable surface and install oil traps  
  • Clean up any spills immediately, through containment and removal of free product and appropriate disposal of contaminated soils.  
  • Keep spill containment and clean-up equipment at all work sites and for all polluting materials used at the site                                                 | Contractor                    | Throughout construction | Weekly visual inspection of vehicles, barges, machinery and refueling/maintenance areas | Number of incidents of non-compliance  
  Number of leaks and spills  
  Cost of cleaning up spills |
| River bank modification works |         | • Minimize the mobilization of sediments and release into the channels and avoid dumping of any material in channels  
  • Conduct baseline river water quality survey and monitor the changes using the parameters such as turbidity, DO, temperature, pH, alkalinity, TS                                                                 | Contractor and Environmental and Social Consultant | Before construction initiation and throughout construction | Weekly visual inspection of construction site and surrounding / downstream land and river areas  
  Biweekly water quality sampling (2 locations at each site) | Indication of pollution of / discharge into river.  
  Water quality monitoring results |
| Ambient environmental quality |         | • Limit the use of heavy machinery and construction activities associated with high noise levels to 08h00 to 17h00 from Mondays to Fridays (In particular in the vicinity of Kyun Sin), and avoid truck transportation (through Let Pan and other settlements along the access road on Sagaing side) .  
  • Notify any nearby residents of if construction work is planned outside of those times.                                                                 | Contractor, all sub-contractors operating machinery | Throughout construction | Daily visual assessment of dust plumes  
  Random machinery checks | Number of registered complaints  
  Visibility of dust coming off construction site |
<table>
<thead>
<tr>
<th>Aspect</th>
<th>ID</th>
<th>Mitigation action</th>
<th>Responsible</th>
<th>Implementation timeframe</th>
<th>Monitoring methods</th>
<th>Performance indicators</th>
</tr>
</thead>
</table>
|        |    | • If complaints regarding noise are received from residents, consider installing partial screening around the noisiest activities and/or mufflers on noisy equipment.  
• Maintain all generators, vehicles, vessels and other equipment in good working order to minimise exhaust fumes and excess noise. Reduce airborne dust at construction sites through e.g.:  
- Damping dust-generating areas with freshwater;  
- Use of cloth or brush-barrier fences; and  
- Covering dumps or stockpiles of lose material with plastic sheeting or netting, especially during windy conditions | Contractor upon PMU/DWIR instruction | In case of emergency only. Implementation within 3 days. | Keep record of complaints received. Number and nature emergency measures implemented | |
| Emergency response to water quality impacts | | In case of construction-related deterioration (e.g. increased turbidity) of river water used for drinking during dry season. The affected community shall be provided with temporary (i.e. up to several weeks) water supply, through appropriate means. E.g. temporary installation of a tube well, lending water filtration equipment, installing temporary water cistern and its regular refilling. | Contractor and Environmental and Social Consultant prepares for PMU/DWIR approval | Before construction initiation and throughout the construction period | Availability of the plan | |
| Waste management | | Develop a waste management plan and implement the waste management plan. | Contractor | Throughout construction | Weekly visual inspection of waste collection and disposal areas  
Weekly visual inspection of construction areas (litter) | Presence of litter  
Availability of rubbish bins and skips | |
<p>| Transport and | | • Prepare and implement traffic management plan | Contractor | Before construction | Keep record of | Number of |</p>
<table>
<thead>
<tr>
<th>Aspect</th>
<th>ID</th>
<th>Mitigation action</th>
<th>Responsible</th>
<th>Implementation timeframe</th>
<th>Monitoring methods</th>
<th>Performance indicators</th>
</tr>
</thead>
</table>
| **traffic management**       |    | • Manage construction sites and activities so as to minimise impacts on road traffic, namely for Let Pan and the communities at the Sagaing bank along the access road, as far as possible, e.g.:  
  o Attempt to arrange delivery of materials when it will least disrupt traffic  
  o Attempt to maximise the occupancy rate of vehicles to minimise the number of required vehicles.  
  • Ensure that all safety measures are observed and that drivers comply with the rules of the road. | and Environmental and Social Consultant prepares for PMU/DWIR approval | initiation and throughout the construction period | incidents and complaints  
  Inspection of required Papers (e.g. truck driving licenses)  
  Weekly visual inspection of vessels | vehicles travelling to site each day  
  Number of incidents and complaints |
| **Biodiversity protection**  |    | • Raise awareness of staff about key issues of concern (see induction and awareness training above), namely:  
  o Ayeyarwady Dolphin  
  o Turtles or turtles ‘nests  
  o Endangered bird species  
  • Check for presence of concerned species on the project site and vicinity shall continually performed, and any disturbance shall be avoided.  
  • Immediate stop all activities in case of an Ayeyarwady Dolphin specimen appearance in the area. | Contractor and all sub-contractors in cooperation with PMU/DWIR and Environmental and Social Consultant | Before construction initiation and throughout the construction period | Visual inspection of construction and camp sites and access roads before the construction by the Environmental and Social Consultant.  
  Regular visual inspection and information received from the construction staff | Recorded appearances of concerned species and related recommendations given to the construction staff |
| **Employment**               |    | • Consider maximising the employment of local workers. Work closely with the local community (i.e. namely with the of Kyun Sin, Let Pan, Gyaint Gyi, Da Ma Kya, Nyang Bin Thar communities, and Pa Thein Gyi and Sagaing townships) to identify and communicate required skills and resources that the local community can provide labour.  
  • Allow for local suppliers (i.e. preferably from Kyun Sin, Let Pan, Gyaint Gyi, Da Ma Kya, Hin Ywet Su, Nyang Bin Thar communities) to conduct business in providing services (e.g. food supply, transport, etc.) to the construction site. | Contractor with consultation of PMU/DWIR | Before construction initiation and throughout the construction period | Keep record of employed staff split by origin | Number of local inhabitants employed |

**Relations with**  
On-site Project Implementation Committee (OPIC)  
PMU/DWIR  
Before construction  
Keep record of employed staff split by origin  
Number of local inhabitants employed
<table>
<thead>
<tr>
<th>Aspect</th>
<th>ID</th>
<th>Mitigation action</th>
<th>Responsible</th>
<th>Implementation timeframe</th>
<th>Monitoring methods</th>
<th>Performance indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>local community</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>complaints or compliments received</td>
<td>complaints or compliments received</td>
</tr>
<tr>
<td></td>
<td></td>
<td>As a part of the induction and awareness training on application of Health and Safety Code of Practices (see above) the instruction to workers regarding interacting with local communities including explicit and strict no tolerance policy on gender based violence shall be given.</td>
<td>Contractor</td>
<td>Regularly, throughout construction Induction training when new personnel comes on site</td>
<td>Keep record of complaints</td>
<td>Number of complaints or compliments received</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maintain a complaints register. The register must record: o Complainant name and contact details; o Date complaint was lodged; o Person who recorded the complaint; o Nature of the complaint; o Actions taken to investigate the complaint and outcome of the investigation; o Action taken to remedy the situation; and o Date on which feedback was provided to complainant.</td>
<td>Contractor in cooperation with PMU/DWIR</td>
<td>Throughout construction</td>
<td>Keep record of complaints</td>
<td>Number of complaints or compliments received</td>
</tr>
<tr>
<td>Construction site rehabilitation</td>
<td></td>
<td>Remove all building materials and obsolete structures from the site after construction. Check the site for contaminated soil and treat any contaminated soil with remediation products. Replant any natural vegetation lost during construction.</td>
<td>Contractor</td>
<td>At the end of construction activities in each respective site</td>
<td>Visual inspection of the site by the PMU/DWIR and Environmental and Social Consultant. If required, sampling of portions of the site to determine contamination Keep records of clean-up activities / disposal of contaminated material</td>
<td>Material and structures remaining on site and in adjacent areas Contamination of soil (e.g. discoloration, test results)</td>
</tr>
</tbody>
</table>
5.2 Institutional arrangement

A Contractor responsible for carrying out the Sub-project 1 works (i.e. the rib-rap armor stone bank protection) will be primary responsible for executing the ESMP, including during the preparatory phase (e.g. preparing site waste management plan, setting up facilities in line with the approved site and construction camp organizational scheme etc.).

The Contractor together with PMU/DWIR (Environmental and Social Staff) and the external Environmental and Social Consultant provided by ICEM will ensure the environmental awareness of project personnel is maintained through appropriate instruction/training in the Environmental, and Social, Health and Safety Codes of Practices (see attached below).

A compliance report on ESMP implementation will be submitted to PMU/DWIR by the Environmental and Social Consultant at the beginning of the works, mid-term and at the end of the construction (see details concerning ESMP reporting below).

Incident Register and Complaint Register will be established by PMU/DWIR to keep record of all irregularities and issues of concern. In case of Contractor’s failing to respond directly to complains or accommodate reported grievances, any affected person can report its concern to the On-site Project Implementation Committee (OPIC) involving the PMU/DWIR.

On-site Project Implementation Committee (OPIC) will be established upon the initiative of the PMU/DWIR and following stakeholders are to be invited:

- Village Leaders and local representatives (namely representatives of Kyun Sin, Let Pan, Gyaint Gyi, Da Ma Kya, Hin Ywet Su, Nyang Bin Thar communities, and Pa Thein Gyi and Sagaing township administrations to be invited and kept informed)
- DWIR Regional office, Department of Labour (Mandalay Region)
- Police
- Contractor’s staff (work crew managers and supervisor).

The roles and responsibilities of key actors in the context of this ESMP are further specified below.

**Key roles and responsibilities**

**PMU/DWIR**

a) Ensures the project is complying with the environmental and social requirements included in this ESMP, namely through implementing provisions related to the conduct of the contractor in the environmental and social sections in the ToR for the construction works.

b) Develop, promote and foster a shared sense of responsibility for environmental and social performance of the project;

c) Promote environmental awareness and understanding among employees and contractors and community towards environmental and social management and linking project environmental performance to its overall performance;

d) Encourage an understanding of social and cultural sensitivities in local communities and the importance of minimizing project impacts on local lifestyles and culture;

e) Monitor environmental and social performance throughout the project and implement an adaptive management approach to continuous improvement;

f) Maintain an on-going commitment to informing, engaging and involving local stakeholders.

**Contractor**

a) Ensures to satisfy the environmental and social requirements included in this ESMP through implementing provisions related to the conduct of the contractor in the environmental and social aspects, namely by following the Environmental Code of Practices and Social Code of
Practices included in this ESMP and with the advice from Environmental and Social Consultant during the planning and execution of the project works;

b) Promote environmental awareness and understanding among employees through training, identification of roles and responsibilities towards environmental and social management and linking project environmental and social performance to the overall performance evaluation of the responsible staff;

c) Work with local communities and project-affected stakeholders to ensure that they benefit as a result of project development, namely through:
   - Offering employment to the local community members
   - Taking part in the On-site Project Implementation Committee (OPIC) throughout the project implementation

d) Support to the DWIR/PMU appointed Environmental and Social Consultant during his/her site visits and monitoring activities

e) Report immediately any irregularity or issue that might cause environmental problem (such as fuel leakage or pollution) or social conflict (such as complaint from the local community) to Environmental and Social Consultant for an appropriate remediation and report/inform to DWIR/PMU safeguard unit for a decision to implement the remediation.

f) Provide appropriate security and enclosures to prevent unauthorized entry into the construction camp area.

Environmental and Social Consultant (ICEM)

a) Provides ongoing support to the PMU/DWIR to supervise Contractor’s performance in Environmental and Social aspects;

b) Provides training to the Contractor’s staff on Environmental and Social, Health and Safety Codes of Practices and their application;

c) Provide the advices to the Contractor on the preparation of specific management plan required by this ESMP

d) Carry out environmental monitoring and prepare weekly observation and monitoring records to feed into periodic (monthly) ESMP Reporting and Submit the report to PMU/DWIR;

e) Provide support PMU/DWIR and Contractor on mitigation of any unforeseen or environmental and social impact identified during the project implementation in coordinating with the engineering supervision specialist;

f) Lead in OPIC meetings and additional stakeholder consultation as required

On-site Project Implementation Committee (OPIC)

OPIC will be the key institutional arrangement facilitating communication and addressing concerns of local stakeholders related to the construction site and project management. The PMU/DWIR will chair the committee, and will hold a weekly update on-site meeting and/or initiate further meetings to address any pressing issue.

In addition, the OPIC shall be considered as a platform for identifying and addressing grievances reported by the members of local communities or other stakeholders.

5.3 Implementation schedule

The ESMP for the bank protection component of the Sub-project 1 will be implemented by an appointed Environmental and Social Consultant and the awarded contractor in coordinating with PMU/DWIR in following phases:

1. Initial phase (Before construction initiation, approx. January - February 2018)
This phase involves setting up the institutional underpinning for the ESMP, namely:

- Including the ESMP provisions and related materials (Environmental Code of Practices, and Social, health and safety Code of Practices) in the contracting documents
- Setting up the OPIC, and appointing the external Environmental and Social Consultant staff
- Finalization of the Abbreviated Resettlement Action Plan
- Preparation and approval of the special management plans (e.g. construction camp scheme, waste management plan)

2. **Construction phase (February–April 2018)**

   **Initial stage:**
   - Environmental and Social awareness raising training/instruction of the construction staff (upon first appearance on the construction site).
   - Setting up storage and camp facilities in line with the ESMP

   **Full construction stage:**
   - Regular monitoring and reporting

3. **Post-Construction phase (April - August 2018)**

   - Construction site rehabilitation and monitoring
   - Final reporting

5.4 **Monitoring and Reporting**

Monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures and provide information on the progress and results of mitigation as envisaged by this ESMP are presented in this section.

Safeguard Unit of PMU/DWIR will provide the supervision periodically along with the International and National Environment and Social Monitoring Specialists from ICEM and ICES Environment and Social Monitoring Specialists are responsible for regular monitoring supervision and reporting the results of the ESMP monitoring and (i.e. inception, mid-term, and final Report) to PMU/DWIR based on following inputs:

**During the Initial phase**

- Own inspection the planning documents (including those prepared by the Contractor),
- Own observation of the construction site(s) and camp site(s) design

**During the construction phase**

- Own observation of the construction site(s) and camp site(s) – regular weekly and random inspections
- Own records from the meetings, notifications and/or interactions in the framework of OPIC
- Environmental monitoring reporting prepared periodically (i.e. inception, mid-term, and final Report) by the external Environmental and Social Consultant – including records of Performance indicators (see Mitigation Management and Monitoring Matrix above)
- Reporting by the Contractor (based on the records of selected ESMP Performance indicators, which are linked to the construction progress (employment, transport volumes and traffic intensity, etc.)

**During the post-construction phase**
- Own observation of the construction site(s) and camp site(s)
- Observation record prepared by the external Environmental and Social Consultant related to the state of the site after the construction works termination (identification of residual impacts, contamination and waste littering etc.)

*During the project component and ESMP implementation (i.e. approximately 3-4 months) the formal ESMP Reporting will take place in three stages (i.e. inception, mid-term, and final Report) focusing on*

1. Compliance with ESMP, namely state of the implementation of specific mitigation actions
2. Performance in key indicators
3. Reports on critical issues, as required.

The National Environmental and Social Monitoring Specialist of ICEM support the development of the substantial content of the ESMP Reporting through:

- Submitting weekly records from environmental monitoring according to:
  - ESMP Performance indicators
- Submitting inputs (as requested) to the main periodical ESMP Reporting, summing up observations related to:
  - Compliance with ESMP, namely state of the implementation of specific mitigation actions
  - Performance in key indicators
  - Other critical issues

5.5 Costs estimation

This section provides overview of the costs associated with mitigation and monitoring measures that are regarded as additional, i.e. beyond costs to be directly bore by the Contractor to comply with existing standards and applicable legislation and key provisions of the Environmental Code of Practices and Social, health and safety code of Practices (e.g. ensuring good state and maintenance of used vehicles, and the like - see indicative list of measures to be implemented by the Contractor without additional costs further below).

Only costs associated with the implementation of the ESMP are presented. Costs of ARAP implementation are not included in this overview, as they will be determined and administered through the autonomous process. Neither are included costs of the full-time presence of the Environmental and Social Consultant (1 person), which is budgeted separately within the ESIA/ESMP for the Subproject 1 contract.

**Table 4: Costs estimation for ESMP implementation**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (USD)</th>
<th>Subtotal (USD)</th>
<th>To be paid by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources of OPIC weekly meetings (15 on-site meetings with participation of PMU/DWIR, and coordinated with PMU site visits - no airfare or accommodation etc. included)</td>
<td>1,200</td>
<td>1,200</td>
<td>PMU/DWIR</td>
</tr>
<tr>
<td>Initial on-site training in ESMP and codes of practices for the construction staff (half day for the managers and crew foremen, half day for workers)</td>
<td>800</td>
<td>800</td>
<td>PMU/DWIR</td>
</tr>
<tr>
<td>Site visits by PMU/DWIR</td>
<td>2,000</td>
<td></td>
<td>PMU/DWIR</td>
</tr>
<tr>
<td>Item</td>
<td>Cost (USD)</td>
<td>Subtotal (USD)</td>
<td>To be paid by</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Transportation and Accommodation</td>
<td>2,000</td>
<td></td>
<td>PMU/DWIR</td>
</tr>
<tr>
<td><strong>Water quality on-site measurement</strong></td>
<td></td>
<td>1,300</td>
<td>ICEM</td>
</tr>
<tr>
<td>Regular sampling</td>
<td>800</td>
<td></td>
<td>ICEM</td>
</tr>
<tr>
<td>(costs for 2 locations, weekly or in response to complaints, to be conducted by the ICEM Monitoring Specialist)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contingency (e.g. sampling and analysis of contaminated soil from construction site if necessary)</td>
<td>500</td>
<td></td>
<td>ICEM</td>
</tr>
<tr>
<td><strong>Construction and camp site(s) equipment</strong></td>
<td></td>
<td>1,200</td>
<td>Contractor</td>
</tr>
<tr>
<td>Spill containment and clean-up equipment at all work sites (i.e. 2 oil spill response kits)</td>
<td>500</td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td>Waste bins and/or skips installation at the construction site(s)</td>
<td></td>
<td>500</td>
<td>Contractor</td>
</tr>
<tr>
<td>Regular waste and other disposed materials removal and transport to the authorized landfill/waste disposal site throughout the construction period and after completion</td>
<td></td>
<td>500</td>
<td>Contractor</td>
</tr>
<tr>
<td>Safety and traffic signs for access roads, storage areas and facilities</td>
<td>200</td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td><strong>Camp facilities and equipment</strong></td>
<td></td>
<td>700</td>
<td>Contractor</td>
</tr>
<tr>
<td>Hygienic sanitary facilities, i.e. latrines and bathing places. The minimum number of toilet facilities required is one toilet for every ten persons.</td>
<td>500</td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td>Maintain stock of medicines in the sites</td>
<td>200</td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td><strong>Sub Total</strong></td>
<td></td>
<td>7,200</td>
<td></td>
</tr>
<tr>
<td>Contingency (5%)</td>
<td></td>
<td>360</td>
<td></td>
</tr>
<tr>
<td>Emergency drinking water impacts mitigation: equipment to ensure temporary supply of drinking water for affected community (Contingency)</td>
<td>3000</td>
<td>3000</td>
<td>PMU/DWIR for the Contractor</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>10,560</td>
<td></td>
</tr>
</tbody>
</table>

Indicative lists of measures not incurring additional costs to the ESMP implementation (i.e. to be ensured by the Contractor directly and covered from Contractor’s own resources):

- Construction of temporary access roads and tracks;
- Construction of temporary storage and housing facilities;
- Provide personal protective equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection as adequate for any particular work;
- Regular maintenance and check-up of vehicles, vessels and machinery;
• Good house-keeping practices on the construction and camp sites;
• Provide appropriate security personnel to ensure prevention of conflict and loss equipment, and material;
• Provision of safe and reliable water supply to the workforce;
• All clean-up or contamination containment and final rehabilitation of the site(s); and
• Appoint staffs in charge of environmental and occupational health and safety as well as communication and community relations (i.e. attending OPIC meetings).

6 ABBREVIATED RESETTLEMENT ACTION PLAN (ARAP)

The construction of bank protection is not expected to have any severe impacts on living standards, no physical relocation and less than 10 % of livelihood or assets affected therefore an ARAP is required to comply with World Bank safeguard policy OP4.12. The following unavoidable loss of livelihoods may occur in relation to loss of agriculture land during the construction of the bank protection works.
The affected area from the construction of the bank protection works is farmland, currently used to cultivate peanuts (due for harvest in mid-February 2018). The average area of farmland belonging to PAPs is 0.50 acres and owners are from both Kyun Sin and Ta Laing Zin villages.

6.1 Consultation

The team and PMU visited the villages near the proposed bank protection structures on 27-28 December 2017 to determine the number of project affected persons (PAPs). In the Sagaing channel, it was determined that there are 17 PAPs affected by the construction of the bank protection measures; 7 farmers in Kyun Sin village, and 10 farmers in Ta Laing Zin village. The area of farmlands along the riverbank is decreasing gradually every year due to erosion and the farmers were supportive of bank protection works (Figure 11). The village representatives, including PAPs, requested to PMU/DWIR that the construction of bank protection proceeds quickly to prevent riverbanks from further erosion, so they agreed to donate their land without receiving any compensation for loss of land. It was agreed that the PMU/DWIR would implement a land donation process associated with bank protection works.
6.2 Land donation

Following the consultation with PAPs and village representatives on 27-28 December 2017, Voluntary Donation of Land and Assets Agreement Form (in accordance with Farmland 2012 Law) were developed for the areas of land that would be affected in the Sagaing and middle channels:

- **Sagaing channel:** Land donation forms prepared for the 7 farmers from Kyun Sin village and 10 farmers to donate % of alluvial land to the State (Appendix 1); and
- **Middle channel:** Land donation forms prepared for village representatives from Seta, Hin Ywet Su and Nyaung Pin Thar to donate the area classified as Vacant Land to the State (Appendix 2).

The team visited sub-project 1 site and surrounding villages on 10 & 17 January 2018 to finalize the land donation process. The team was composed of two members from ICEM, one from the PMU and one member from Mandalay DWIR office. The field visit was organized to update, explain and collect signatures from the PAP on the Voluntary Donation of Land and Assets Agreement Form. The remaining signatures were collected on a further site visit on 17 January 2018 and during the Public Consultation for the Draft ESIA for Subproject 1 and ESMP for Bank Protection which was attended by PAPs and village representatives. The list of PAPs and village representatives for the and donation process for the Sagaing and middle channel is provided in Appendix 3.

6.3 Monitoring and implementation of ARAP

The implementation and monitoring of the ARAP will be carried out as part of the overall ESMP detailed in Section 5 above.
7 EMSP APPENDICES

7.1 Environmental Code of Practices

7.1.1 Waste Management

The Contractor shall:

- Develop waste management plan for various specific waste streams (e.g. construction waste, domestic and sanitary waste) prior to commencing of construction with the advice from the Environmental and Social Consultant and submit to PMU/DWIR for approval.
- Prohibit burning of solid waste and disposal to the river.
- Do not establish site-specific landfill sites. Collect and transport wastes to the approved disposal sites. Vehicles transporting solid waste shall be covered with tarps or nets to prevent spilling waste along the route.
- Train and instruct all personnel in waste management practices and procedures.
- Provide refuse containers at each worksite.
- Place a high emphasis on good housekeeping practices.
- Maintain all construction sites in a cleaner, tidy and safe condition and provide and maintain appropriate facilities as temporary storage of all wastes before transportation and final disposal.

7.1.2 Fuels and Hazardous materials Management

The Contractor shall:

- Train the relevant construction personnel in handling of fuels and spill control procedures.
- Store fuels, lubricants and hazardous substances in designated areas on a top of a sealed plastic sheet away from watercourses.
- Refueling shall occur only within designated areas.
- Provide absorbent and containment material (e.g., absorbent matting) where hazardous material are used and stored and personnel trained in the correct use.
- Make sure all containers, drums, and tanks that are used for storage are in good condition. Check for leakage regularly to identify potential problems.

7.1.3 Construction site and equipment management

The Contractor shall:

- Stockpile materials in sufficient distance from the river, avoid agriculture land.
- Wash out ready-mix concrete agitators and concrete handling equipment at washing facilities off site or into approved bunded areas on site, where final cleanup and soil rehabilitation is feasible.
- Minimize the generation of sediment during the bank modification and related earth-works, do not dispose the removed top-soil to the river but allow for further utilization.
- Monitor the water quality downstream from the construction site and improve work practices as necessary
- Do not discharge cement and water curing used for cement concrete directly into the river

7.1.4 Ambient environmental quality protection

The Contractor shall:

- Employ only vehicles and construction machinery in good technical condition and with appropriate exhaust systems.
Cover haul vehicles carrying dusty materials moving outside the construction site
Limit equipment and vehicular movements to within the approved construction zone and access corridors
Construct temporary access tracks through bare lands and send bars to avoid agriculture land and areas with natural vegetation
Focus special attention on minimizing the emissions from generators
Establish adequate locations for unloading, handling, storage, of construction materials, in a way that dust dispersion is prevented and to avoid noise pollution to local residents
 Appropriately site all noise generating activities to minimize impact on local residents

**7.1.5 Protection of local ecosystems**

The Contractor shall:

- Reduce disturbance to surrounding vegetation. Clear only the vegetation that needs to be cleared in accordance with the plans (both in the construction areas as well as for any associated activities such as sites for stockpiles, disposal of topsoil and construction of diversion roads, etc.). Get approval from supervising Environmental and Social consultant for clearance of vegetation.
- Supply appropriate fuel in the work camps to prevent fuel wood collection.
- Prevent disturbance and destruction of active nests or eggs of birds and turtles.
- Provide adequate instruction to the workers regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching.

**7.1.6 Protection of Fisheries**

The Contractor shall:

- Minimize the generation of suspended sediment during the bank modification and related earth-works, do not dispose the removed top-soil to the river but allow for further utilization
- Ensure the riverine transports, vessels and ships are well maintained and do not have oil leakage to contaminate river water.
- Contain leakage immediately on river in case of accidental spillage of fuel from vessels or storage area. In this regard, make an emergency oil spill containment plan to be supported with enough equipment, materials and human resources.
- Prevent dumping of any wastes into the river.

**7.1.7 Transport and traffic management**

- Prepare and submit a traffic management plan to the PMU/DWIR for approval before commencing work
- Include in the traffic management plan to ensure uninterrupted traffic movement during construction:
  - Detailed drawings of traffic arrangements showing all detours, temporary roads, planned project-related barricades or diversions on public roads (if any), and
  - Indication of intensity/frequency of project-related traffic (i.e. number of trucks per day) on supply lines to the construction sites.

**7.2 Social, health and safety code of Practices**

**7.2.1 Construction Camp Management**

The Contractor shall:
• Locate the construction camps preferably on sand bars away from communities in order to minimize risk of social conflict and to avoid the possible adverse impacts of the construction camps on the surrounding communities.
• Submit to the PMU/DWIR for approval a detailed layout plan for the development of the construction camp showing the relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (e.g. for use in power supply generators), solid waste management and dumping locations, prior to the development of the construction camps.
• Local authorities responsible for health, religious and security shall be duly informed on the set up of camp facilities so as to allow for effective surveillance over public health, social and security matters.
• Provide the following facilities in the campsites:
  o Adequate housing for all non-commuting workers (i.e. who does not have a residence in adjacent communities)
  o Safe and reliable water supply.
  o Hygienic sanitary facilities, i.e. latrines and bathing places. The minimum number of toilet facilities required is one toilet for every ten persons.
• Provide fuel to the construction camps for their domestic purpose, in order to discourage use fuel wood or other biomass.
• Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse.
• Train all construction workers in health care issues and safety matters, and on the specific hazards of their work.
• Provide instruction to all workers on basic sanitation and best hygiene practices. Place display boards at strategic locations within the camps containing messages on best hygienic practices.
• Provide appropriate security personnel (police / home guard or private security guards) and enclosures to prevent unauthorized entry in to the camp area.
• Dismantle and remove from the site all facilities established within the construction camp
• Restore the site to its condition prior to commencement of the works or to an agreed condition with the landowner.

7.2.2 Relations with local communities
The Contractor shall:
• Communicate to the public through community consultation regarding the scope and schedule of construction and access restriction.
• Resolve any conflicting issues in consultation with local leaders and supervision consultants
• Establish a mechanism that allows local people to raise grievances arising from the construction process – maintain a complaint register.
• Inform the local authorities responsible for health, religious and security affairs before commencement of civil works so as to maintain effective surveillance over public health, social and security matters

7.2.3 Worker Health and Safety
The Contractor shall:
• Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas.
• Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection as adequate for any particular work.

• Implement safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job.

• Ensure the local authorities responsible for health and safety are duly informed before commencement of civil works and establishment of construction camps.

• Not hire children of less than 15 years of age.
### Project description:

The Republic of the Union of Myanmar, Ministry of Transportation and Communications, and Directorate of Water Resources and Improvement of River Systems (DWIR), is implementing Ayeyarwady Integrated River Basin Management Project (AIRBMP) with the support of World Bank. Aiming to promote safe navigation and improve public safety along the Mandalay waterway, component 3 (River navigation Enhancement) of AIRBM project will implement Hydraulic roughness measures (porcupines) and associated bank protection works in Side channel (Kho Taung ) and Middle Channel (Nyaung Pin Thar). Bank protection work will be implemented during 2017 ~ 2018 dry season and hydraulic measures will be implemented during 2018 ~ 2019 dry season respectively. The project would cover some land area along the river bank in order to implement bank protection at the side and middle channels and the owners/user of that land voluntary donate their land and assets for the sake of improvement of river and prevention of erosion.

### APPENDIX 1: VOLUNTARY DONATION OF LAND AND ASSETS AGREEMENT FORM FOR SAGAING CHANNEL

**VOLUNTARY DONATION OF LAND AND ASSETS AGREEMENT FORM**

<table>
<thead>
<tr>
<th>Name of Land User:</th>
<th>ID Number:</th>
<th>Beneficiary of the project: Y/N</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sex:</th>
<th>Age:</th>
<th>Occupation:</th>
</tr>
</thead>
</table>

| Contact address of affected person: |
| Contact phone number: |
| Village: |
| Village Tract: |
| Township: |
| Region/State: |

<table>
<thead>
<tr>
<th>Description of land that will be taken by the project:</th>
<th>Area affected (sqft):</th>
<th>Total Land holding area (sqft):</th>
<th>Ratio of land affected to total land held:</th>
<th>Map code:</th>
</tr>
</thead>
</table>

| Description of crops growing on the land now and project impact: |

<table>
<thead>
<tr>
<th>Type of crops</th>
<th>Details</th>
<th>Area of Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop 1:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crop 2:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crop 3:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Describe any other assets (if any) that will be lost or moved to implement the project:
By signing or providing thumb-print in this form, I, ______________________ the land user or owner agrees to donate land and/or assets to the State. The donation is voluntary. I acknowledge that I can refuse to sign or thumb print for donation, and apply for compensation instead.

Date-----------------------

Recipients Signature

Date-----------------------

Donors Signature

Date-----------------------

Witness Signature

Date-----------------------

Witness Signature

Department of Agriculture

Village Tract Administrator

Land Management and Statistics (DALMS)
# 9 APPENDIX 2: VOLUNTARY DONATION OF LAND AND ASSETS AGREEMENT FORM FOR MIDDLE CHANNEL

**Project description:**

The Republic of the Union of Myanmar, Ministry of Transportation and Communications, and Directorate of Water Resources and Improvement of River Systems (DWIR), is implementing Ayeyarwady Integrated River Basin Management Project (AIRBMP) with the support of World Bank.

Aiming to promote safe navigation and improve public safety along the Mandalay waterway, component 3 (River navigation Enhancement) of AIRBM project will implement Hydraulic roughness measures (porcupines) and associated bank protection works in Side channel (Kho Taung) and Middle Channel (Nyaung Pin Thar). Bank protection work will be implemented during 2017 ~ 2018 dry season and hydraulic measures will be implemented during 2018 ~ 2019 dry season respectively. The project would cover some land area along the river bank in order to implement bank protection at the side and middle channels and the owners/user of those land voluntary donate their land and assets for the sake of improvement of river and prevention of erosion.

## VOLUNTARY DONATION OF LAND AND ASSETS AGREEMENT FORM

<table>
<thead>
<tr>
<th>Representative of Land User(s):</th>
<th>Representative: Name:</th>
<th>Beneficiary of the project: Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Representative ID Number:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex:</th>
<th>Age:</th>
<th>Occupation:</th>
</tr>
</thead>
</table>

**Contact Address of Representative:**
- Village:
- Village Tract:
- Township:
- Region/State:

**Indicate type of land that will be donated to the State (please circle):**
- Vacant land
- Farm land
- Grazing land
- Other (please specify):

<table>
<thead>
<tr>
<th>Area affected (sqft):</th>
<th>Total Land holding area (sqft):</th>
<th>Ratio of land affected to total land held:</th>
<th>Map code:</th>
</tr>
</thead>
</table>

**Description of crops growing on the land now and project impact:**

<table>
<thead>
<tr>
<th>Type of crops</th>
<th>Details</th>
<th>Area of Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop 1:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crop 2:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Crop 3:

Others:

describe any other assets (if any) that will be lost or must be moved to implement the project:

by signing or providing thumb-print in this form, i, ___________________________ the representative of the land user agrees to donate land and/or assets to the state. the donation is voluntary. i acknowledge that i can refuse to sign or thumb print for donation, and apply for compensation instead.

<table>
<thead>
<tr>
<th>Date</th>
<th>Recipients Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Donors Signature</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Witness Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Witness Signature</td>
</tr>
</tbody>
</table>

department of agriculture
land management and statistics (dalms)

village tract administrator
## 10 APPENDIX 3: LIST OF PAPS AND REPRESENTATIVES FOR LAND DONATION

### 10.1 List of 17 PAPs from Sagaing Side Channel

#### 10.1.1 Kyunsin Village

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of Land User</th>
<th>National ID Number</th>
<th>Age</th>
<th>Occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>U Htun Lu</td>
<td>9/Pa Tha Ka (N) 058434</td>
<td>56</td>
<td>Farmer</td>
</tr>
<tr>
<td>2</td>
<td>U Myint U</td>
<td>9/Pa Tha Ka (N) 058434</td>
<td>53</td>
<td>Farmer</td>
</tr>
<tr>
<td>3</td>
<td>U Zaw Naing (on behalf of) U Thein Soe</td>
<td>9/Pa Tha Ka (N) 090288</td>
<td>41</td>
<td>Farmer</td>
</tr>
<tr>
<td>4</td>
<td>U San Lwin</td>
<td>9/Pa Tha Ka (N) 058446</td>
<td>53</td>
<td>Farmer</td>
</tr>
<tr>
<td>5</td>
<td>Daw Mar Mar Aye (on behalf of) Daw Nwet Nwet Win</td>
<td>-</td>
<td>43</td>
<td>Farmer</td>
</tr>
<tr>
<td>6</td>
<td>Daw Khin Saw (on behalf of) U Wai Zin Soe</td>
<td>-</td>
<td>26</td>
<td>Farmer</td>
</tr>
<tr>
<td>7</td>
<td>U Thein Po (on behalf of) U Aung Swe</td>
<td>9/Pa Tha Ka (N) 058523</td>
<td>48</td>
<td>Farmer</td>
</tr>
</tbody>
</table>

#### 10.1.2 Talaizin Village

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of Land User</th>
<th>National ID Number</th>
<th>Age</th>
<th>Occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>U Tin Tun</td>
<td>5/Sa Ka Na (N) 063119</td>
<td>57</td>
<td>Farmer</td>
</tr>
<tr>
<td>2</td>
<td>U Kyaw Soe</td>
<td>5/Sa Ka Na (N) 005497</td>
<td>41</td>
<td>Farmer</td>
</tr>
<tr>
<td>3</td>
<td>U San Tun</td>
<td>5/Ma Ta Na (N) 034165</td>
<td>45</td>
<td>Farmer</td>
</tr>
<tr>
<td>4</td>
<td>U Zan Yin (on behalf of) Daw Htay Kyi</td>
<td>5/Sa Ka Na (N) 063108</td>
<td>-</td>
<td>Farmer</td>
</tr>
<tr>
<td>5</td>
<td>U Win Myint</td>
<td>5/Sa Ka Na (N) 191639</td>
<td>42</td>
<td>Farmer</td>
</tr>
<tr>
<td>6</td>
<td>U Man Khin</td>
<td>5/Sa Ka Na (N) 063081</td>
<td>62</td>
<td>Farmer</td>
</tr>
<tr>
<td>7</td>
<td>U Myint Wai</td>
<td>5/Sa Ka Na (N) 063017</td>
<td>53</td>
<td>Farmer</td>
</tr>
<tr>
<td>8</td>
<td>U Myint Zaw</td>
<td>5/Sa Ka Na (N) 063189</td>
<td>55</td>
<td>Farmer</td>
</tr>
<tr>
<td>9</td>
<td>Daw Khin Pyone (on behalf of) U Myint Zaw</td>
<td>5/Sa Ka Na (N) 063176</td>
<td>50</td>
<td>Farmer</td>
</tr>
<tr>
<td>10</td>
<td>U Than Soe</td>
<td>5/Sa Ka Na (N) 063101</td>
<td>49</td>
<td>Farmer</td>
</tr>
</tbody>
</table>

### 10.2 List of Representatives from Middle Channel

#### 10.2.1 Seta Village

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of Representative of Land Users</th>
<th>National ID Number</th>
<th>Age</th>
<th>Occupation</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>U Tint Swe</td>
<td>9/Pa Tha Ka (N) 048551</td>
<td>71</td>
<td>Farmer</td>
<td>100 HH Head</td>
</tr>
</tbody>
</table>

#### 10.2.2 Hinywetsu Village

<table>
<thead>
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<th>No.</th>
<th>Name of Representative of Land Users</th>
<th>National ID Number</th>
<th>Age</th>
<th>Occupation</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>U Kyaw Min Tun</td>
<td>9/Pa Tha Ka (N) 000166</td>
<td>45</td>
<td>Farmer</td>
<td>Village Head</td>
</tr>
</tbody>
</table>
10.2.3 Nyaungpinthar Village

<table>
<thead>
<tr>
<th>Name of Representative of Land Users</th>
<th>National ID Number</th>
<th>Age</th>
<th>Occupation</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>U Khaing Zaw Htike</td>
<td>9/Pa Tha Ka (N) 092760</td>
<td>35</td>
<td>Farmer</td>
<td>Village Head</td>
</tr>
</tbody>
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