# Tat Lan Hydrological Masterplan

# Volume II: Minbya Township

Yangon
February 2013

# CONTENTS

# 4 MINBYA TOWNSHIP

## 4.1 OVERVIEW

In Minbya Township, a total of 20 villages were selected for the Tat Lan program. These are presented (with updated population figures and some additional comments) in the table below.

| Sr | Township | Village Tract | Village Name | # HH | POP TOT | Ethnicity (Rakhine, Muslim, Chin) | Vill_Pcode | Comments |
|---|---|---|---|---|---|---|---|---|
| 1 | Minbya | Thar Yar Kone | Ent Pya | 33 | 150 | Chin | 197230 | Ent Pya Village, Thar Yar Kone VT |
| 2 | Minbya | Hnget Pyaw Chaung ( L ) | Hnget Pyaw Chaung ( L ) | 125 | 542 | Rakhine | 197206 | |
| 3 | Minbya | Yin Chaung | Lat Pan Kaing | 50 | 140 | Rakhine | 197205 | P-code 197205, not 197244. Yin Chaung VT, not Kha Maung Daw VT (does not exist) – GPS coordinates in Tat Lan list are for Khaung Laung Chaung Village, Khaung Laung Chaung VT. Much fewer people than in original list |
| 4 | Minbya | Khway Tauk Chaung | Leik Kyauk Ya | 30 | 139 | Rakhine | 197237 | |
| 5 | Minbya | Kyaung Taung | Ah Haung Taung | 93 | 386 | Chin (Le Tu) | 197171 | |
| 6 | Minbya | Kyaung Taung | Gwa Son | 186 | 826 | Chin (Le Tu) | 197176 | |
| 7 | Minbya | Kyaung Taung | San Kyoe | 102 | 481 | Chin (Le Tu) | 197182 | |
| 8 | Minbya | Kyein Chaung | Thinga Net Taung Maw | 70 | 375 | Chin | 197214 | P-code 197214, not 197213. Much fewer people than in original list. Ethnicity Chin, not Rakhine. |
| 9 | Minbya | La Har Kyay | La Har Kyay | 240 | 1225 | Rakhine | 197242 | |
| 10 | Minbya | Taung Shey Pyin | Kywe Na Phar Sue | 80 | 359 | Chin (Sun Tu) | 197196 | P-code 197196, not 197195. Much fewer people than in original list. |
| 11 | Minbya | Taung Shey Pyin | Pyin Gyi | 20 | 92 | Chin | 197201 | |
| 12 | Minbya | Taung Shey Pyin | Taung Shey Pyin | 111 | 475 | Chin | 197194 | Many more people than in original list. |
| 13 | Minbya | Taung Shey Pyin | Tha Pyoke Yay Myet | 57 | 241 | Chin | 197200 | |
| 14 | Minbya | Yan Htaing | Thaing Kyet | 53 | 245 | Chin | 197235 | Many more people than in original list. |
| 15 | Minbya | Yan Htaing | Yan Htaing | 198 | 529 | Rakhine | 197231 | Yan Htaing, not Yan Tine |
| 16 | Minbya | Yin Chaung | Nat Kan Pyin | 58 | 282 | Chin | 197204 | |
| 17 | Minbya | Yin Chaung | Yin Chaung | 230 | 1218 | Chin | 197203 | Many more people than in original list. |
| 18 | Minbya | Zin Yaw Maw | Zin Yaw Maw | 160 | 699 | Chin | 197208 | |
| 19 | Minbya | Zin Yin Maw | Mhin Tauk | 111 | 516 | Chin | 197206 | P-code 197206, not 197208. Fewer people than in original list. |
| 20 | Minbya | Zin Yin Maw | Te Nan Pyin | 119 | 580 | Chin | 197212 | |

Some of the villages are found in clusters (see figure 1 below). These villages are reported on together. Others are isolated from other Tat Lan villages. These villages are treated separately. In the remainder of the chapter, the villages are presented as they are found west to east, and north to south.
Most of the villages selected in Minbya fall into tidal zone III. Only MI 02, MI 04, MI 09, MI 14, MI 15 and MI 18 fall into tidal zone II.

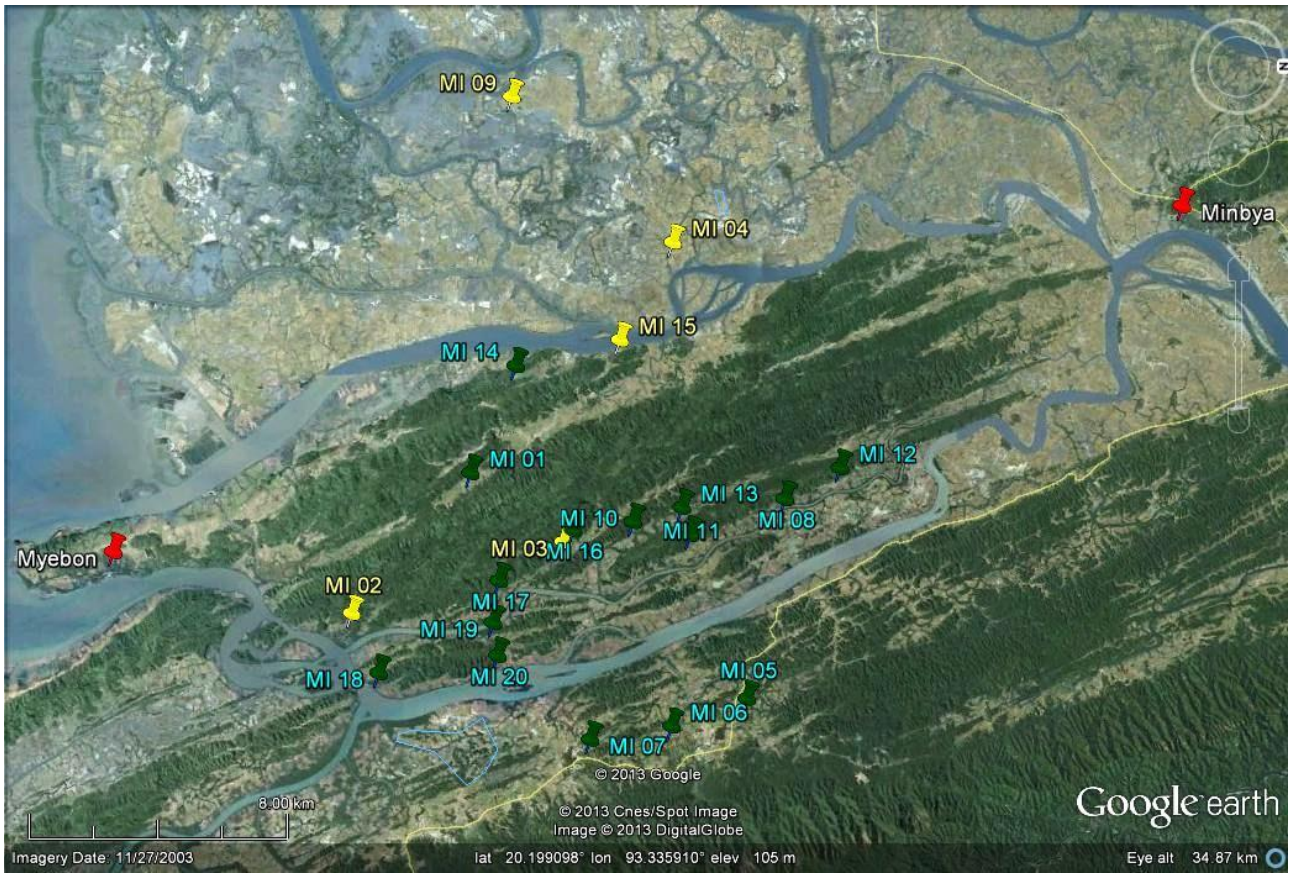

*Figure 1. Tat Lan villages in Minbya Township*

## 4.2 SCATTERED VILLAGES IN WESTERN MINBYA

The western part of Minbya consists of flat islands with paddy fields and prawn ponds (see figure 2). In this area, two scattered villages were selected for Tat Lan. According to the Tat Lan village list, a third village (Let Pan Kaing, MI 03) was in this part of Minbya, but the only village with that name is located in Yin Chaung VT.

The embankment study identified three embankments for repair in this area with a total length of almost 180,000 feet. Only a part of one of these embankments protects a village on the Tat Lan list. Repairing these three embankments to the standards set in Volume I of this report would cost roughly 900,000 USD, and sluices will cost another 100-300,000 USD (depending on the number of sluices that are already in place). This is three times as much as the estimate given by the embankment study team, mostly because of the larger volume of earthwork. While these embankments protect almost 6,000 acres of paddy land and prawn ponds, including them in the Tat Lan program will eat up quite a lot of the available budget.

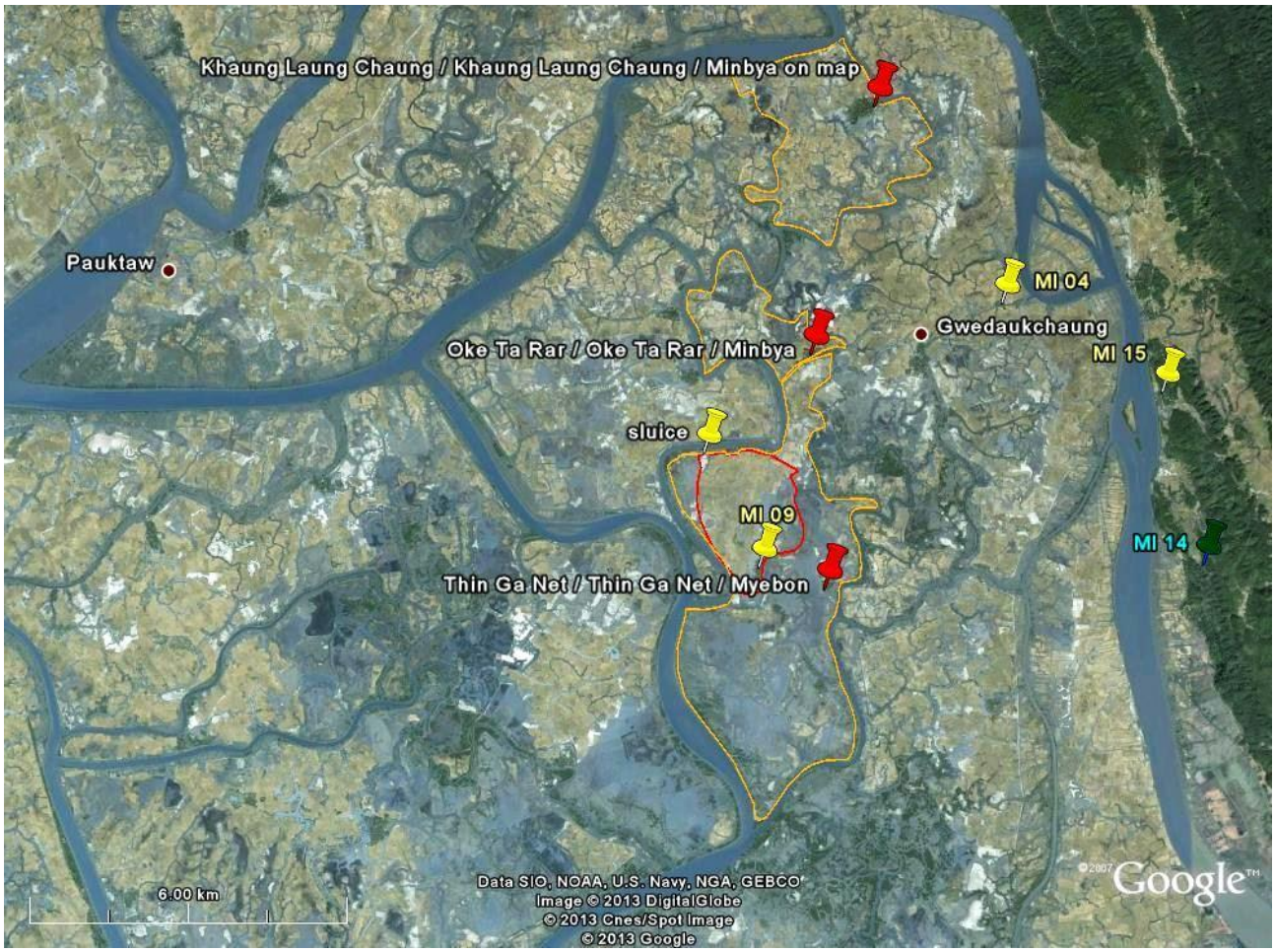


*Figure 2. Approximate embankment location, MI 09 (red line = village only; orange lines = approximate locations of embankments listed in the embankment study)*

### 4.2.1 LEIK KYAUK YA (MI 04)

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 04 | Minbya | Khway Tauk Chaung | Leik Kyauk Ya |
| **Introduction**<br>Leik Kyauk Ya is a very poor village. Only two households are farmers. Together, they cultivate 5.5 acres. The other 28 households are landless labourers. | | | |
| **Embankments**<br>No activities needed. This village has only very little paddy land. | | | |
| **Sluicess**<br>No activities needed. | | | |

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 04 | Minbya | Khway Tauk Chaung | Leik Kyauk Ya |
| **Drinking water**<br>No activities needed. This village has enough drinking water available | | | |
| **Irrigation**<br>No possibilities. | | | |
| **Other**<br>What is needed in this village is livelihoods support to offer additional / alternative sources of income to the inhabitants.<br>The villagers asked for a bridge to be improved across the creek, so they can reach the other side. There is an old bridge there now, but it is dangerous. | | | |

### 4.2.2 LA HAR KYAY (MI 09)

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 09 | Minbya | La Har Kyay | La Har Kyay |
| **Introduction**<br>La Har Kyay is located near the boundary with Myebon Township. It has many acres of prawn ponds, some of which are located in Myebon Township. Of the 245 households, 45 are farmers. They cultivate a total of 798 acres of paddy. There are also 477 acres of prawn ponds, owned by a small number of wealthy people. The remaining households are landless.<br>The paddy fields are affected by salt water, and yields are low at 30 baskets per acre (about 1.5 MT/ha).<br><br>The embankment around this village's fields was not listed separately in the embankment study, but the polder seems to have been included in an 88,700 feet long embankment reported at Thin Ga Net.<br><br>The following data are for the embankment around La Har Kyay only, with in italics new estimates for the large embankment reported in the embankment study. | | | |
| **Embankments**<br>The village has one embankment around its paddy fields (see figure 2). It has a length of about 27,000 feet and needs repairs. A second embankment, around the prawn ponds, also needs repairs. However, as the prawn pond owners are wealthy people, repairing this embankment does not need to be a priority for Tat Lan.<br>This embankment<br>Average design crest level = spring high tide plus 3' freeboard. This is about 5' above land side ground level for half of the embankment, and about 8' for the other half.<br>Design crest width = 4'.<br>Sideslope = 1:1.5<br>Average design base width = 19' for the half that is about 5' high, and 36' for the half that is about 8' high.<br>Total volume of earthwork needed: approx. 1,900,000 cubic feet (53,800 $m^3$)<br>Total estimated cost: about 114,000 USD (91.2 million MMK).<br><br>*Average design crest level = same as above*<br>*Design crest width = same as above*<br>*Side slope = same as above*<br>*Average design width = same as above*<br>*Total volume of earthwork needed: approx. 6 million cubic feet (170,000 $m^3$)*<br>*Total estimated cost: about 360,000 USD (288 million MMK)* | | | |

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 09 | Minbya | La Har Kyay | La Har Kyay |

**Sluices**

The catchment area within the embankment is 100% polder, and the average ground level is around 2' above MSL. As the polder is located in Zone II, 798/320 ~ 3 sluices are needed.

There are currently two 6' wide sluices in the embankment with a sill level around 1' above lowest low tide level (1' higher than the proposed design level). This means that one additional sluice needs to be constructed.

The existing sluices are in good condition, except for the wooden gates. It is recommended to replace these by flap gates.


*For the large embankment (which includes the prawn ponds that are outside the embankment mentioned above), the total catchment area is about 4,400 acres. This means that 4,400/320 ~14 sluices are needed. Apart from the two sluices mentioned above, there may be more sluices available, so the total number of sluices to be constructed will be 12 or less.*

**Drinking water**

No interventions needed. There is enough drinking water.

**Irrigation**

If the embankment is repaired and the inflow of saltwater is managed, the creeks inside the polder will contain an estimated 250 acre-feet (about 300,000 $m^3$) of freshwater. Maximum about 1/3 of this can be used for irrigation (the rest needs to be kept as a buffer against inflowing saltwater). That is enough for irrigating about 200 acres of non-rice crops.

*For the large embankment, the total volume of water that will be retained in the blocked creeks will be about 1,000 acre-feet; enough for irrigating about 800 acres of non-rice crops.*

**Other**

N/A

## 4.3 SCATTERED VILLAGES IN CENTRAL MINBYA

In the central part of Minbya, three more or less scattered villages are included on the Tat Lan list: Ent Pya (MI 01) in Thar Yar Kone VT and Thaing Kyet (MI 14) and Yan Thaing (MI 15) in Yan Thaing VT. All three villages are in separate catchment areas and have adjoining villages that were not selected for Tat Lan. None of the villages were included in the embankment study.

### 4.3.1 ENT PYA (MI 01)

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 01 | Minbya | Thar Yar Kone | Ent Pya |
| **Introduction**<br>Ent Pya is a small village at the upstream end of a little valley. It is only accessible by foot, with the nearest village about 2.5 km away. Of the 33 households, only two engage in paddy cultivation on a total of 7 acres. One villager cultivates 2 acres of winter crops. Most households live off agricultural labour and/or wood cutting. | | | |
| **Embankments**<br>This village has no embankments. | | | |
| **Sluices**<br>This village does not need any sluices | | | |
| **Drinking water**<br>This village has enough drinking water. In the dry season there is a spring. | | | |
| **Irrigation**<br>There is no potential for irrigation development. | | | |
| **Other**<br>N/A | | | |

### 4.3.2 THAING KYET (MI 14)

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 14 | Minbya | Yan Thaing | Thaing Kyet |
| **Introduction**<br>Thaing Kyet has 53 households. 5 farmers cultivate 18 acres of paddy land, and 9 households cultivate about 9 acres of winter crops. More important in this village is shifting cultivation on the hillsides: 33 households cultivate about 130 acres. There is also some rubber cultivation. | | | |
| **Embankments**<br>The village has no embankments. | | | |
| **Sluices**<br>The village does not needs any sluices | | | |
| **Drinking water**<br>The village has enough water. There is a spring that ACF has fitted with a storage tank, a pipeline and a tap stand in 2005. | | | |
| **Irrigation**<br>There is no potential for irrigation development. Because the hillsides are steep, there is no suitable place for constructing a reservoir. | | | |
| **Other**<br>N/A | | | |

### 4.3.3 YAN THAING (MI 15)

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 15 | Minbya | Yan Thaing | Yan Thaing |

**Introduction**

Of the 198 households in this village, 44 cultivate about 70 acres of paddy fields. These fields are located on high ground, so there is no problem with salinity. Most of the other households engage in fishing. Two people have prawn ponds.

**Embankments**

Two short embankments around the prawn ponds need to be upgraded (see figure 3). Each pond is owned by a single person. The total volume of work is about 58,300 cubic feet (1,650 $m^3$). That will cost about 2.8 million MMK (about 3,500 USD).

**Sluices**

No additional sluices are needed.

**Drinking water**

The village has enough water, but the villagers would like to expand one pond to have a more secure drinking water availability in the dry season.

**Irrigation**

There is no potential for irrigation development.

**Other**

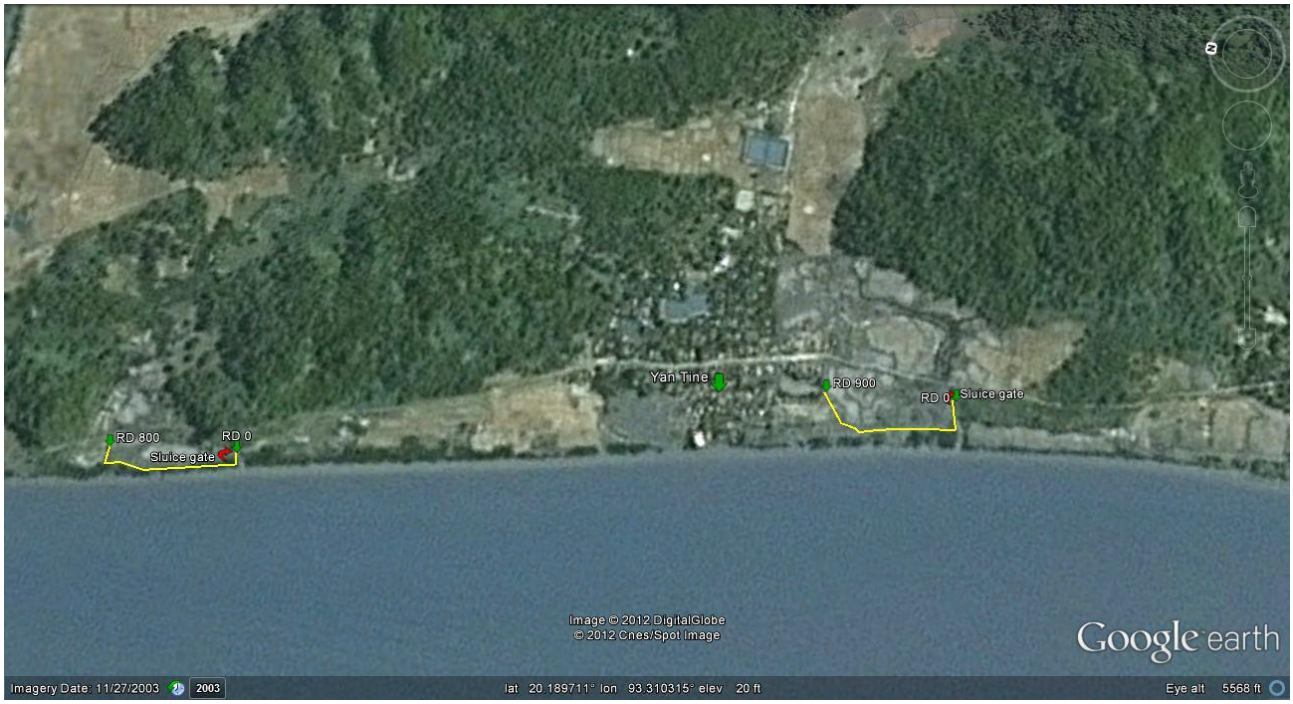


*Figure 3. Approximate locations of embankments, MI 15*

## 4.4 CLUSTER OF VILLAGES IN CENTRAL MINBYA (CENTERED AROUND YIN CREEK)

This cluster covers a total of 12 villages on the Tat Lan list (see figure 4). They are all located in the catchment area of the Yin Creek, in Taung Shey Pyin, Kyein Chaung, Zin Yin Maw and Auk Hnget Pyaw Chaung Village Tracts. A further 18 villages are located in the catchment area of this creek, which also includes Kay Tha Lar Pyun Wa, Kay Tha Lar Chaung Wa, Kywe Kyo and Yin Bway Village Tracts. Five of these 30 villages are located east of a row of hills that separates them from the eastern shore of the Yin Creek, but as there are flat areas with creeks in between the hills, damage to embankments on one side of the hills will very likely affect the areas on the other side.

The total catchment area of Yin Creek is about 10,500 ha (25,900 acres), which gives an average drainage flow (over a six-day period of peak rainfall with a return period of ten years) of 176 $m^3/s$, with an expected peak flow at least twice as high., On top of that, a small part of the water from the hills north of Minbya town also flows through this creek.

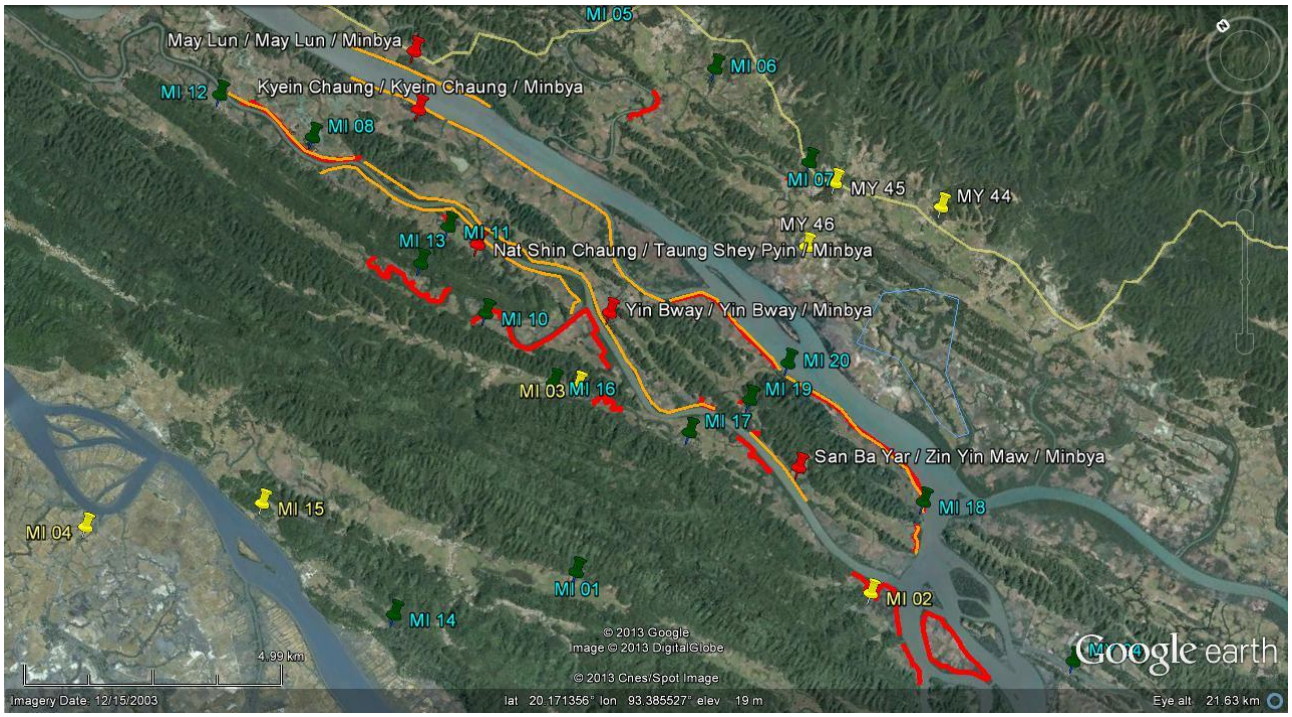


*Figure 4. Villages and embankments in central Minbya area (orange lines: embankments in embankment study; red lines: embankments of villages on the Tat Lan list)*

The embankment study lists 18 embankments in this area, which includes pretty most of the shore of the Yin Creek from Taung Shey Pyin southwards and embankments along a large creek on the eastern side of the island to the east of the Yin Creek, and one embankment on the opposite side of this large creek at May Lwon [also known as May Lun]). Embankments along the smaller creeks that branch off the Yin Creek are however not included.

Since repairing an embankment on one side of any creek reduces the cross-section that water can flow through, the water level in the creek may increase during the peak of the rainy season. This in turn affects the fields on the other side of the creek. Therefore, it makes good sense to look at embankments on the other shore of any creek where an embankment is repaired. The embankments listed in the embankment study are indeed relevant to repair as a whole, even though they protect the fields of a larger number of villages than those included in the Tat Lan list.

Blocking the Yin Creek on both ends would make sense. In this way, two short embankments with a combined length of 6,000 – 10,000 feet (2-3 km) can replace about 100,000 feet (about 33 km) of embankments between Taung Shey Pyin and Auk Hnget Pyaw Chaung that currently need repairs. The northern embankment (which can be constructed either at the north end of the creek, or between two hills at Tha Ya Gu Ywar Thit can be a simple blocking structure, while the southern embankment will need a structure to evacuate drainage water flowing into the creek. These two embankments will cost only about

50,000 USD instead of about 500,000 USD for the repair of the entire embankments along the creek, and the amount of maintenance work that is required will be reduced substantially.
There are no prawn ponds along the Yin Creek, which means that a reduction in salinity in the creek will not affect aquaculture (and it will have a positive effect on paddy yields). Fishing in the creek may however be affected negatively if no fish that can handle less salty water are introduced. This must be carefully looked into.
The biggest bottleneck however is the cost of the concrete structures that are needed. The creek and its branches are used for boat transport in the absence of proper roads, which means that locks capable of handling boats up to about 60 feet long are required in both embankments. Besides, the discharge flowing through the creek is so large that the required sluices may be prohibitively expensive. Only the part south of Tha Ya Gu Ywar Thit village has a catchment area of about 12,500 acres. Being located in drainage zone II and with about 40% of the catchment area being flat land or creek, this means that about 30 7' x 5' sluices are needed (or a smaller number of larger sluices). Constructing sluices with such a large capacity and constructing locks is probably beyond the capacity of the Tat Lan program, and would require cooperation in making customised designs from the Irrigation Department, as well as partial financing.

While this option is worth further investigation, it is unlikely that it will be possible to develop something within the funding period of Tat Lan. Therefore, this section looks at the Tat Lan villages along the Yin Creek at the level of sub-catchments, from north to south:

- MI 12,
- MI 08, Kyein Chaung and May Lun,
- MI 11, Sin Oe, Kha Maung Taw and Nat Shin Chaung,
- MI 10 and MI 13,
- MI 16, MI 03 and MI 17,
- MI 20 and 19,
- MI 18 and MI 02.

Comments referring to embankments in non-Tat Lan villages that affect the paddy fields of the villages on the Tat Lan list are made in italics.

### 4.4.1 TAUNG SHEY PYIN (MI 12)

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 12 | Minbya | Taung Shey Pyin | Taung Shey Pyin |

**Introduction**
Taung Shey Pyin has 111 households, among whom there are 37 farmers. They cultivate 350 acres of paddy. There are also ten fishermen and 64 landless households.

**Embankments**
The fields of Taung Shey Pyin are a little higher above the water level than in other villages, and they are not much affected by saltwater (it is likely that tidal variation here is limited, since the village is quite far upstream along a fairly narrow creek). The existing village embankments are sufficient, and no additional work is needed.

**Sluices**
No sluices are needed.

**Drinking water**
The village has a shortage of drinking water if the dry season lasts longer than normal. There are two ponds and two wells, and a spring further away from the village. This spring was improved (with tanks and pipelines) by ACF in 2002, but the pipes have been broken since about 2005. Villagers indicated a preference for adding another pond and upgrading the existing pond and wells. If the tanks and pipes connected to the spring can be repaired, that might also be a good idea – but only if a system for maintenance can be put in place.

**Irrigation**
There are no irrigated fields in this village.

**Other**
N/A

### 4.4.2 THIN GA NET TAUNG MAW (MI 08), KYEIN CHAUNG AND MAY LUN

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 08 | Minbya | Kyein Chaung | Thin Ga Net Taung Maw |

**Introduction**

This village has a population of 70 households. There are 30 farmers who cultivate 170 acres. About 50 people are engaged in nipa palm cultivation, on a total area of 20 acres. There are 10 fishermen. Most of the non-farming households mostly engage in wood cutting, sawing and farm labour.
Thin Ga Net Taung Maw is located on the eastern bank of the Yin Creek.

**Embankments**

The embankment study identified two embankments in need of repair, with a total length of 9,000 feet. CDN's assessment team found that these embankments have not yet been repaired.
Average design crest level = 6.5 feet (including 3' freeboard)
Design crest width =. 4 feet
Sideslopes 1:1.5 (for everything except for the stretches across creeks); 1:2 (for stretches across creeks)
Average design base width = 45-50 feet for stretches across creeks, and 20-25 feet for the rest of the embankment.
Total volume of earthwork needed: approx. 950,000 cubic feet (26,900 $m^3$)
Total estimated cost: about 57,000 USD (45.6 million MMK).

*In order to fully protect the fields of Thin Ga Net Taung Maw (and Kyein Chaung village), a further embankment of about 5,700 feet long must be repaired at Kyein Chaung village. This will cost about 35-40,000 USD.*

*If a more detailed analysis in this area indicates that embankment repair at Kyein Chaung will increase flood levels at May Lun village on the other side of the river, then an embankment of about 10,000 feet long must be repaired at May Lun as well. This will cost about 60-70,000 USD.*

**Sluices**

There are currently no proper sluices. The catchment area is about 850 acres, of which 90% is polder. Being located in zone III, and with a surface level about 3' above MSL, this means that 850/208 ~ 4 sluices are needed. If they are constructed in two blocks of two sluices, this will cost about 75-80,000 USD if a pile foundation is needed, or about 50-60,000 USD if the sluices can be built on a rock foundation.

*If the embankment is constructed at Kyein Chaung, the catchment area will expand by about 460 acres, 60% of which is hills. This means that a further 3 sluices are needed, costing about 55-60,000 USD with pile foundation or about 40-45,000 with a rock foundation.*

*If the embankment is constructed at May Lun, a further detailed study must be done to establish the number of sluices required. Inland from May Lun village there are hills and there is a creek that drains water from these hills towards the river near the village, but this creek also takes a big turn southwards and flows into the river there as well. A first estimate is that at least a catchment area of about 360 acres drains towards the embankment, which would require three sluices, costing about 55-60,000 USD with pile foundation or about 40-45,000 with a rock foundation. If however most water can be drained southwards through the creek, the number of sluices can be reduced to one or two. If the creek brings in water from further east, the required number of sluices will be more than three.*

**Drinking water**

Thin Ga Net Taung Maw has some shortage of drinking water quite often, and sometimes a severe shortage of drinking water. There are no spring sources near the village, so people go across the creek to a spring near Sin Oe village. It is recommended to excavate a drinking water pond in this village (and to provide fencing to the available water points). This will cost between 1,000 and 3,000 USD.

**Irrigation**

There is no possibility for irrigation development in this village.

**Other**

N/A

### 4.4.3 PYIN GYI (MI 11), SIN OE, KHA MAUNG TAW AND NAT SHIN CHAUNG

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 11 | Minbya | Taung Shey Pyin | Pyin Gyi |

**Introduction**

Pyin Gyi is a small Chin village with 20 households, half of whom are farmers (they cultivate 38 acres of land). The other households are landless.

**Embankments**

The paddy fields of the village are protected by a short embankment of some 550 feet in length.
Average design crest level = 5.5 feet
Design crest width =. 4 feet
Sideslopes 1:1.5 (for everything except for the stretch across the creek); 1:2 (for the stretch across the creek)
Average design base width = 20 feet (more for the stretch across the creek)
Total volume of earthwork needed: approx. 49,000 cubic feet (1,400 $m^3$)
Total estimated cost: about 3,000 USD (2.4 million MMK)

*The embankment study listed embankments along the entire stretch of paddy fields of Pyin Gyi, Sin Oe, Kha Maung Taw and Nat Shin Chaung (under the name of Nat Shin Chaung village). Together, these embankments have a length of some 21,200 feet. With proper sideslopes, freeboard and crest width, this will cost about 120,000 USD (96 million MMK).*

**Sluices**

The fields protected by the embankment have a catchment area of about 100 acres, 40% of which is paddy land. As the village is in Zone III, this means that one sluice is needed.

*The entire embankment proposed by the embankment study has a catchment area of about 1,050 acres, 40% of which is paddy land. This means that 7 sluices are needed. This will cost about 120-140,000 USD if a pile foundation is needed for the sluices, or about 80-95,000 USD if the sluices can be built on a rock foundation.*

**Drinking water**

Pyin Gyi has some shortage of water during the dry season. The village has two small ponds (one for drinking water, and one for domestic use), and both dry up towards the end of the dry season. In case of water shortage, people go to the adjoining village of Nat Shin Chaung, which has enough water throughout the year. This village is 1.5 km away. However, the people of Nat Shin Chaung do not like it when others come to take their water.
There is also a spring about 500 metres to the north of the village.
Two possible options are either to enlarge the existing ponds (and to provide fencing), or to improve the existing spring by adding a night storage tank.

*Nat Shin Chaung has enough drinking water, and does not need any water-related interventions..*

**Irrigation**

There is no possibility for irrigation in this village. The repair of the embankment will make small-scale vegetable cultivation possible along the blocked creek.

**Other**

N/A

### 4.4.4 THA PYOKE YAY MYET (MI 13) AND KYWE NA PHAR SUE (MI 10) AND DAR THWAY KYAUK

There are three villages along the Kywe Na Su Creek: Dar Thway Kyauk, Tha Pyoke Yay Myet (MI 13) and Kywe Na Su (MI 10). The total catchment area is about 1,750 acres. About 750-800 acres of this is paddy field. The creek is used by boats right upto the last village, 7 km from the mouth.
In order to protect all the paddy fields, there are two options: construct embankments along the length of the creek plus a stretch up to the hills south of the mouth (about 16 km in total) and sluices in each individual sub-catchment, or a single embankment between hills to the north and south of the mouth of the creek (about 2 km), with a large sluice or lock.
The first option will cost about 150-200,000 USD for the embankments, plus the cost of 12-14 sluices (which comes to about 180,000-200,000 USD). The second option will cost about 25,000 USD for the embankments, plus the cost of a large sluice or lock.

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 13 | Minbya | Taung Shey Pyin | Tha Pyoke Yay Myet |
| **Introduction**<br>This village is located along the Kywe Na Su Creek. Of the 57 households, 20 are farmers (they cultivate about 100 acres) and the remainder are landless. | | | |
| **Embankments**<br>The fields of Tha Pyoke Yay Myet are located on the eastern shore of the Kywe Na Su Creek. An embankment around them is about 9,000 feet long. Upgrading it will protect about 80 acres of paddy fields against saltwater intrusion.<br>Average design crest level = 4.5 feet<br>Design crest width =. 3 feet<br>Sideslopes 1:1.5 (1:2 for stretches where creeks are blocked)<br>Average design base width = 17 feet<br>Total volume of earthwork needed: approx. 450,000 cubic feet (12,750 $m^3$)<br>Total estimated cost: about 27,000 USD (21.6 million MMK). | | | |
| **Sluices**<br>The embankment crosses six creeks. There are currently no sluices. The creeks are blocked with small earth bunds, which are damaged.<br>The total catchment area of the area behind the embankment is about 260 acres, of which 30% is paddy fields. The catchment is located in tide zone III. This gives a sluice requirement of 260 / 100 ~ 3 sluices. For this, it will be useful if the different creeks can be connected to each other. Alternatively, a larger number of smaller sluices can be constructed in the various creeks. | | | |
| **Drinking water**<br>This village has two springs that have a limited yield in the dry season. Upgrading the springs by constructing storage tanks will make it possible to store the night discharge, thus doubling the amount of water that is available for the villagers. | | | |
| **Irrigation**<br>There are no opportunities for developing irrigation in the area, other than through promoting treadle pump irrigation along blocked creeks. Especially the large creek directly south of the village might be suitable for that, since the drainage water from two springs flows into it throughout the dry season. | | | |
| **Other**<br>See comments with MI 10 on comparing the cost of constructing separate embankments or one single embankment and sluices at the mouth of the Kywe Na Su Creek. | | | |

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 10 | Minbya | Taung Shey Pyin | Kywe Na Phar Sue |
| **Introduction**<br>This village is located along the Kywe Na Su Creek.<br>Of the 80 households in this village, 28 are engaged in paddy cultivation on 117 acres. 20 people own 25 acres of land planted with nipa palm. About 2 acres of winter crops are irrigated from a spring. 15 households are engaged in fishing. The remaining houdeholds are landless labourers. | | | |

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 10 | Minbya | Taung Shey Pyin | Kywe Na Phar Sue |

**Embankments**

The fields belonging to this village are located in two large clusters and a small cluster south of the village. They are separated by low hills. The total length of the embankment that is needed is 3,500 metres (14,000 feet). This embankment will protect about 200-220 acres, some of which is cultivated by farmers from adjoining villages.

Average design crest level = 4.5 feet
Design crest width =. 4 feet
Sideslopes 1:1.5
Average design base width = 17 feet
Total volume of earthwork needed: approx. 733,000 cubic feet (20,730 $m^3$)
Total estimated cost: about 44,000 USD (35.1 million MMK).

**Sluices**

The northern cluster of paddy fields has a catchment of about 100 acres, of which about 50% is paddy land. The middle cluster has a catchment area of about 60 acres, of which about 20% is paddy land. The southern cluster has a catchment area of about 245 acres, of which almost 40% is paddy land.
This area is located in tidal zone III. That means that

- the northern cluster needs 100 / 150 = one sluice,
- the middle cluster needs 60 / 80 = one sluice, and
- the southern cluster needs 245 / 150 = two sluices

**Drinking water**

This village has enough water for drinking and domestic purposes. The villagers are however concerned about the protection of their only drinking water pond, and would like to protect this pond with barbed wire.

**Irrigation**

There is no potential for further developing irrigation in this area.

**Other**

N/A

### 4.4.5 NAT KAN PYIN (MI 16), LAT PAN KAING (MI 03) AND YIN CHAUNG (MI 17)

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 16 | Minbya | Yin Chaung | Nat Kan Pyin |

**Introduction**

Nat Kan Pyin is a small village with 58 households. It has a large area of paddy fields located upstream along a small creek.

**Embankments**

This village does not need embankments, as there is no intrusion of saltwater during the cropping season, and any salt that comes in during the dry season is washed out at the start of the rainy season.

**Sluices**

N/A

**Drinking water**

**Irrigation**

In Nat Kan Pyin, there is potential for developing a small irrigation weir. The stream that flows past the village is fed by many springs, and has a flow quite far into the dry season. Because of that, not much storage is needed – the main thing is to raise the water level in the stream in order to be able to divert the water into irrigation channels on both sides of the stream. A stone weir of about 15' high and 100' long will serve the purpose, and will allow irrigation of 100 acres of winter crops.

**Other**

N/A

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 03 | Minbya | Yin Chaung | Lat Pan Kaing |

**Introduction**

This village is located along the Yin Chaung Creek, together with Yin Chaung and Nat Kan Pyin.
Total paddy land: 80 acres, cultivated by 17 farmers.
Nipa palms: 11 acres, cultivated by 7 farmers.
Winter crops: 2 acres, cultivated by 6 farmers.

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 03 | Minbya | Yin Chaung | Lat Pan Kaing |

**Embankments**

For this village, one embankment was identified for rehabilitation. It is about 1,700 feet long, and protects about 20 acres. Two small blocking embankments (15' and 35' long) need to be repaired.
Average design crest level = spring high tide plus 3' freeboard = 6' above land side ground level
Design crest width = 3'.
Sideslopes 1:1.5
Average design base width = 18'
Total volume of earthwork needed: approx. 135,000 cubic feet (3,800 $m^3$)
Total estimated cost: about 8,100 USD (6.5 million MMK)

**Sluices**

There is currently no sluice. The catchment area behind this embankment is 20 acres of paddy fields and about 140 acres of hills. The village is located in Zone III, which means that 160/54 ~ 3 sluices are needed to protect the embankment. Because the percentage of paddy fields in this catchment area is so low, the design freeboard for the embankment has been increased from 2' to 3'.

**Drinking water**

No activities needed. This village has enough drinking water available. It is possible to upgrade a spring by constructing a tank, pipeline and tap stands.

**Irrigation**

No possibilities, because of steep slopes and the risk of landslides and rockfall.

**Other**

This village used to be famous for pepper, but the plants were destroyed by Giri. Plantations are currently regrowing.

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 17 | Minbya | Yin Chaung | Yin Chaung |

**Introduction**

Yin Chaung is located along the Yin Chang Creek, together with the villages of Let Pan Kaing (MI 03) and Nat Kan Pyin (MI 16). This village has 230 households. 65 farmers cultivate 367 acres of paddy field. Nipa palms are grown on 160 acres by 65 households. Fishing is done by 13 people, and aquaculture by 10 people (they use about 5 acres of prawn ponds). Many households engage in cutting firewood, and there are also some households who earn income by seasonal migration to other states.
The farmers and prawn pond owners are in conflict with each other over what should happen with the water.

**Embankments**

One embankment, originally constructed by UNDP, was identified as severely damaged. It is about 2,500 feet long. It was not included in the embankment study.
Average design crest level = spring high tide plus 2' freeboard = 6' above land side ground level (increasing from south to north)
Design crest width = 3 feet.
Sideslopes 1:1.5 for those parts that are less than 6' high; 1:2 for the taller parts.
Average design base width = 20-22 feet
Total volume of earthwork needed: approx. 200,000 cubic feet (5,700 $m^3$)
Total estimated cost: about 12,000 USD (9.6 million MMK)

**Sluices**

There are four small sluices (4' deep, 2.5' wide) connecting the prawn ponds to the creek. Two more sluices (5' x 5.5' and 5.5' x 5') are found further north. One needs a sluice, the other needs to be reconstructed entirely.
The embankment has a catchment area of about 240 acres, and has about 40% paddy fields. It is located in Zone III, and needs 240 / 80 ~ 3 sluices. If the existing sluices are renovated where necessary, they should have enough capacity. If the sluices connecting the prawn ponds to the creek are not connected to the paddy fields (by a bund in between for example), one standard sluice needs to be constructed.

**Drinking water**

Drinking water is not a problem in this village. However, to increase the amount of water that can be harvested from a nearby spring, it is possible to construct a small buffer reservoir.

**Irrigation**

There is no irrigation in this village.

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 17 | Minbya | Yin Chaung | Yin Chaung |
| **Other**<br>If the entire triangle of land between the Yin Creek, the Yin Chaung Creek and the hills is to be protected, the volume of work that is necessary will roughly double. | | | |

### 4.4.6 TE NAN PYIN (MI 20) AND MHIN TAUK (MI 19)

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 20 | Minbya | Zin Yin Maw | Te Nan Pyin |
| **Introduction**<br>Te Nan Pyin has 119 households. Farming is done by 44 households on 196 acres of land. There are 30 fishermen. The remaining 45 households are landless and depend on labour. | | | |
| **Embankments**<br>The fields of Te Nan Pyin are enclosed on one side by a row of hills, and on the other side by an embankment of around 9000 feet long. This embankment was included in the embankment study. The embankment itself is damaged. Besides, there are nine gaps in the embankment that need to be blocked.<br>Average design crest level = spring high tide plus 3' freeboard = 6 feet above land side ground level for the southern 1/3 of the embankment. The northern 2/3 of the embankment is on average 8 feet tall.<br>Design crest width = 5 feet.<br>Sideslopes 1:1.5 for the embankment; 1:2 for the current gaps.<br>Average design base width = 24-32 feet<br>Total volume of earthwork needed: approx. 900,000 cubic feet (25,500 $m^3$)<br>Total estimated cost: about 54,000 USD (43.2 million MMK) | | | |
| **Sluices**<br>The embankment of Te Nan Pyin has a total catchment area of about 325 acres, of which a little less than 20% is hills. The area is in Zone III, and thus needs 325 / 180 ~ two sluices. There are already three wooden structures, each consisting of two sluices of 3' to 3.5' wide and 4' deep. If these structures can be renovated, a single sluice needs to be added. Alternatively, the sluices can be fully replaced by a second sluice. | | | |
| **Drinking water**<br>The village has enough drinking water. | | | |
| **Irrigation**<br>There is no possibility for irrigation development in this village. | | | |
| **Other**<br>The southern part of Te Nan Pyin's fields is connected to the fields of Mhin Tauk (MI 19). The embankments of both villages must be repaired together, because saltwater flowing in through one area can flow into the other village's fields. | | | |

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 19 | Minbya | Zin Yin Maw | Mhin Tauk |
| **Introduction**<br>Mhin Tauk has 111 households. Farming is done by 33 households on 147 acres of land. There are 12 fishermen, and nipa palm is cultivated by 15 people on about 23 acres. The remaining households are mostly landless labourers. | | | |
| **Embankments**<br>Three short embankments were identified in the village. Two of these embankments are along the Yin Creek to the southwest and northwest, while the third embankment is just outside the village to the northeast. All three embankments need a freeboard of 3' and a crest width of 5'.<br>The combined length of these embankments is 2,200 feet.<br>Total volume of earthwork needed: approx. 250,000 cubic feet (7,100 $m^3$)<br>Total estimated cost: about 15,000 USD (12 million MMK) | | | |

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 19 | Minbya | Zin Yin Maw | Mhin Tauk |

**Sluices**

The embankment southwest of Mhin Tauk has a large triple sluice, which was constructed by UNDP. This embankment has a total catchment area of about 430 acres, about 40% of which is polder. The size of the existing sluices is sufficient.

The embankment northeast of Mhin Tauk goes across the same creek that is blocked by the abovementioned embankment (only then a little further upstream). It does not have sluices. This embankment has a catchment area of 300 acres, about 50% of which is polder. That means that this embankment needs two sluices.

The embankment northwest of Mhin Tauk has a small catchment area of only 30 acres, of which 25% is polder. In this catchment area, a single 2' wide sluice is enough.

**Drinking water**

Mhin Tauk has enough drinking water.

**Irrigation**

There is no potential for developing irrigation in this village.

**Other**

N/A.

### 4.4.7 ZIN YIN MAW (MI 18) AND HNGET PYAW CHAUNG (MI 02)

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 18 | Minbya | Zin Yin Maw | Zin Yin Maw |

**Introduction**

Zin Yin Maw has 160 households. 17 households are reported to be farmers (cultivating 168 acres), 30 are fishermen, and 51 are labourers. 3 people own 15 acres of nipa palms, and 7 people cultivate winter crops (2 acres) This does not add up to the total number of households, so this needs to be verified.

**Embankments**

The village has two embankments: one to the southwest of 1600 feet long, and one to the northeast of 14,000 feet long.

Average design crest level = spring high tide plus 3' freeboard = 6-8 feet above land side ground level (more for the southern embankment, less for the northern embankment)

Design crest width = 5 feet.

Sideslopes 1:1.5 for the embankment; 1:2 for the current gaps.

Average design base width = 20-25 feet (more where the gaps are filled)

Total volume of earthwork needed: approx. 1,550,000 cubic feet (44,000 $m^3$)

Total estimated cost: about 93,000 USD (74.3 million MMK)

**Sluices**

There are currently no sluices in both embankments. The southern embankment has one blocking embankment that is broken during periods of heavy rain and rebuilt at the start of the dry season, and the northern embankment has nine such blocking embankments.

The southern polder has a catchment area of about 300 acres. About 30% is paddy fields, the rest is hills. This area is located in Zone II. This gives a design ratio of about 380 acres per standard sluice, which means that one sluice is needed.

The northern polder has a catchment area of about 520 acres. About 40% is paddy fields, the rest is hills. This area is also located in Zone III, and has a design ratio of 360 acres per standard sluice. This means that two sluices are needed.

**Drinking water**

Zin Yin Maw has enough drinking water.

**Irrigation**

Two possible sites for development of small irrigation reservoirs were identified. However, both locations are in use as teak nurseries It is not sure if developing irrigation is feasible compared to the profits of teak cultivation.

**Other**

N/A

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 02 | Minbya | Hnget Pyaw Chaung | Hnget Pyaw Chaung |

**Introduction**

This village has 125 households. Paddy is grown by 44 households (they cultivate 280 acres). 12 farmers cultivate about 10 acres of winter crops. There are 20 fishermen, and 64 landless households. 11 acres of nipa palms are cultivated by 9 households.

**Embankments**

The paddy fields are located in four clusters near the village, and on an island nearby. There are four separate embankments: one north of the village (embankment 1), two south of the village (embankments 2 and 3), and one on the island (embankment 4). The total length of the embankments (about 21,000 feet) was destroyed in 2010 and needs repairs. They were not included in the embankment study.

Average design crest level = spring high tide plus 3' freeboard = 6-8' above land side ground level

Design crest width = 5' for embankments 1,2 and 3; crest width 3' for embankment 4.

Sideslopes 1:1.5 (except for current gaps in creeks and those parts where the embankment is more than 8.5' high).

Average design base width = 20-25'

Total volume of earthwork needed: approx. 2.5 million cubic feet (71,000 $m^3$)

Total estimated cost: about 150,000 USD (120 million MMK)

**Sluices**

The requirements for sluices must be calculated separately for each catchment area. All catchment areas are in zone II.

The northernmost embankment has a catchment area of about 600 acres, of which about 20% polder. It has one wooden sluice in poor condition. It might be best to replace it. This gives a need for two standard sluices. Note that only part of the fields in this catchment area belong to Hnget Pyaw Chaung. The northern half of this area belongs to another village.

The embankment just south of the village has a catchment area of about 400 acres, of which about 30% polder. It has three wooden sluices that are in poor condition. Therefore, it might be best to replace them. This gives a need for one standard sluice.

The southernmost embankment has a catchment area of about 175 acres, of which about 30% polder. It has no sluices. This gives a need for one standard sluice.

The island has an area within the embankment of around 150 acres. All of this is polder. It does not have any sluices. There is a need for one sluice (a width of 3' will be enough).

**Drinking water**

There is enough water in the village. The village has three ponds (they dry up in the dry season), two tubewells (both are out of order), one open well and three springs. The people requested for the springs to be protected and improved.

**Irrigation**

South-west of the village, there are two possible locations for constructing small irrigation reservoirs. This can provide irrigation to several dozen acres.

**Other**

N/A

## 4.5 CLUSTER OF VILLAGES IN EASTERN MINBYA AND NORTH-EASTERN MYEBON (ALONG THE ANN-SITTWE ROAD)

In the eastern part of Minbya, three villages have been selected along the Ann-Sittwe road (see figure 5 below): Ah Haung Taung (MI 05), Gwa Son (MI 06) and San Kyoe (MI 07). Together with the other villages in Kyaung Taung VT, they are located in a plain between the interior hills of Minbya and the Min River, which is the easternmost salty water body in Minbya. The part of the plain in which the villages are located is drained by two creeks: the Chaung Net Creek and the Shauk Chon Creek. The Shauk Chon Creek (and its branches the Ye Gaung Creek and the Kyant Hin Khar Creek) also drains the fields of three selected villages in Myebon Township: Kyant Hin Khar (MY 44), Kyar Inn Taung (MY 45) and Shauk Chon (MY 46). Further south, the plain continues into Myebon Township. That part of the plain is drained by more creeks.

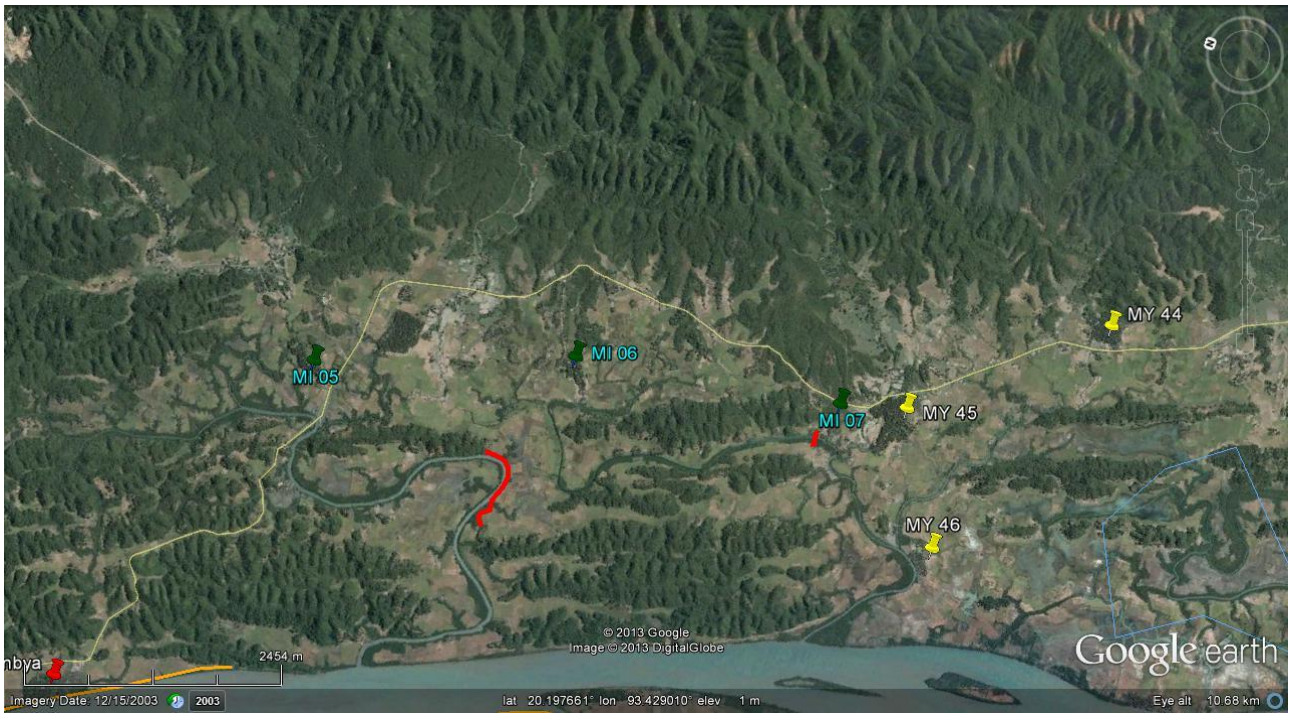


*Figure 5. Tat Lan villages in eastern Minbya. Red lines indicate embankments to be repaired.*

The fields of Gwa Son, San Kyoe, Kyar Inn Taung and Shauk Chon are affected by inflow of saline water in the Shauk Chon Creek during the dry season. The southern branch of his creek (the Kyant Hin Khar Creek) is blocked at Shauk Chon; the northern branch (the Ye Gaung Creek) is blocked at San Kyoe. The condition of both existing blocking embankments is not good, and saline water still affects the upstream paddy fields. Improving both blocking embankments will protect several hundred acres of paddy fields against salinity. However, because the creek has a large hilly catchment area, the design peak discharge that the structures should be able to cope with is in the order of magnitude of 30-50 $m^3/s$. For this reason, three options are possible in both locations: an Irish bridge (vented causeway) with stop logs or flap gates in the sluice openings, a duckbill weir (with a total crest length of at least 40 metres and a crest level of at least 1 m below the surrounding land level) or a bund of clay or sand bags that is reconstructed every year at the end of the rainy season.
Blocking the Ye Gaung Creek near Shauk Chon would protect an even larger area against salt intrusion, but this part of the creek is used for boat movements between Kyar Inn Taung and Myebon.

Similarly, some fields of Gwa Son (as well as the nearby villages of Cheit Auk, Chaung Net and Kyaung Taung, which are not on the Tat Lan list) are affected by salt water through the Chaung Net Creek. This creek has a similar catchment area and a similarly high peak discharge. Also, this creek is used for navigation all the way to Ah Haung Taung, which means that blocking it is most likely not an acceptable solution.

There are several small dams and small embankments that can be constructed in the other villages of Kyaung Taung VT that are not on the Tat Lan list. These have not been included in this report, but the details are available.

### 4.5.1 AH HAUNG TAUNG (MI 05), GWA SON (MI 06) AND SAN KYOE (MI 07)

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 05 | Minbya | Kyaung Taung | Ah Haung Taung |

**Introduction**
Ah Haung Taung has about 80 acres of rainfed paddy field. This land is at a slightly higher elevation, and there do not seem to be many problems with salt damage. Of the 93 households, 13 engage in paddy farming,10 in fishing, and 13 in processing of products from nipa palm trees.

**Embankments**
There are no embankments in this village that need renovation.

**Sluices**
There are no sluices in this village that need renovation.

**Drinking water**
The village has some shortage in the dry season. In that case, people go to Cheit Auk or to Kyaung Taung (Kan Ni). Both of these villages are less than a kilometre away. Construction of a tubewell fitted with a hand pump might be a good idea.

**Irrigation**
Some vegetables are cultivated with water that is taken from the wells. This is only a very small area. There are no other opportunities for irrigation.

**Other**
N/A

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 06 | Minbya | Kyaung Taung | Gwa Son |

**Introduction**
Gwa Son has about 122 acres of paddy fields, owned by 43 farmers. A further 8 households have 11 acres of nipa palms.

**Embankments**
The villagers have constructed a small bund of about 3,200 feet long along the Chaung Net Creek to protect their fields against floods and salt water, but it is not big enough. Last year, salt water caused the loss of 70 acres of paddy.
Average design crest level = spring high tide plus 2' freeboard = 4' above land side ground level
Design crest width = 3'.
Sideslopes 1:1.5
Average design base width = 15'
Total volume of earthwork needed: approx. 130,000 cubic feet (3,700 $m^3$)
Total estimated cost: about 7,800 USD (6.2 million MMK)

**Sluices**
There is currently no sluice in the embankment. Because the area is flat and there is another creek a couple of hundred metres further south (it flows towards San Kyoe), heavy rainfall will probably drain in southern direction at some point. It might be good to either construct a small sluice (3' wide, 6' high) in the embankment, or to dig a small drainage channel towards San Kyoe.

**Drinking water**
The village has some shortage during two months of the year. Between Gwa Son and Kyaung Taung village, there is a good spring that can be developed. If a 300-400 $m^3$ storage tank is constructed (with concrete walls an floor, and a tin sheet roof), night flow can be harvested, and the effective yield can be doubled to about 600-800 $m^3$/day. That is more than enough water for the entire village (and adjoining villages).

**Irrigation**
A small irrigation reservoir can be constructed near coordinates 20.20256 N / 93.43584 E. At this location, the stream has a catchment area of about 50 acres. A channel will need to be dug across the Ann-Sittwe road (there is an existing culvert which will need to be used for spill water). The total length of the dam will be about 150 feet, and the total height will be about 20 feet. Live storage capacity of the reservoir will be about 7,000 $m^3$. With a little extra inflow in the first half of the rainy season, this is enough to irrigate some 10-20 acres of non-rice crops.
Total volume of earthworks: about 100,000 cubic feet for the embankment, plus some 30,000 cubic feet for the channels. Total estimated cost: about 25-40,000 USD (20-35 million MMK). A detailed design will need to be developed.

**Other**
N/A

| Number | Township | Village Tract | Village |
|---|---|---|---|
| MI 07 | Minbya | Kyauk Taung | San Kyoe |

**Introduction**

San Kyoe has 102 households. 24 households cultivate 151 acres of paddy. 11 households grow nipa palms, and 3 households cultivate winter crops.

There is a construction company in the village with heavy machinery (bulldozers, graders), which they are willing to lease out at affordable rates.

**Embankments**


The creek near the village has been blocked about 20 years ago with help from villagers of neighbouring villages. A part of the dam was left open in the rainy season, and closed again every year at the beginning of the dry season. The water that was stored was used for non-rice winter crops and for livestock drinking water. Besides, the dam functions as a bridge that connects the village with its cemetery and outlying paddy fields. The bridge is slippery when wet, and at least two people have drowned after falling off. During Giri, the dam was damaged, and since then salt water has entered and affected paddy fields of San kyoe and Gwa Son.

This dam has a large catchment (about 3,100 acres), of which about 70% is hilly and 30% is flat. This gives an estimated design discharge of some 30 $m^3/s$ over a 24 hour period. The design peak discharge will then be around 60 $m^3/s$. During the assessment, the flow through the opening was substantial, and must have been at least about 20 $m^3/s$.

As the river banks are sufficiently high here, the best solution is probably to construct a duckbill weir with a crest length of at least 40 metres upstream of the two channels that exist (there seems to be a rock foundation, which would make things a little easier). The existing two channels must then be widened. Also the bridge needs to be improved and fitted with proper railings on both sides.

A detailed site investigation will be necessary before this is constructed. The total cost of the construction will probably be in the range of 50-70,000 USD (40-50 million MMK).

**Sluices**

See above.

**Drinking water**

The village has some water shortage in the dry season. When that happens, people go to Kyar Inn Taung, about 500 metres away.

**Irrigation**

A site for development of a small irrigation reservoir was identified near coordinates 20.18444 N / 93.43224 E, just outside the village. This reservoir will have a live storage capacity of about 7,000 $m^3$, and can irrigate some 10-20 acres of non-rice crops. Besides, the reservoir can serve as a complementary source of drinking water for the village.

**Other**

N/A

### 4.5.2 KYANT HIN KHAR (MY 44), KYAR INN TAUNG (MY 45) AND SHAUK CHON (MY 46)

More details on these villages will be provided in the report on Myebon Township.

## 4.6 SUMMARY OF SUGGESTED INTERVENTIONS IN MINBYA

The table below summarises the possible interventions in Minbya Township, which covers about 10% of all Tat Lan villages. Green shading indicates priority interventions. As can be seen, only the marked priority interventions have an estimated cost of US $ 650-960,000, which is 10-15% of the roughly US $ 6 million allocation for embankments, sluices and related infrastructure. Constructing all that needs to be done in Minbya will cost over US $ 2 million

| | Embankments | | Sluices | | Irrigation | | Drinking water | | Other infrastructure | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Village** | **$M^3$** | **US $** | **No.** | **US $** | **Intervention** | **US $** | **Intervention** | **US $** | **Intervention** | **US $** |
| MI 01 | - | - | - | - | - | - | - | - | - | - |
| MI 02 | 71,000 | 150,000 | 5 sluices | 65-100,000 | - | - | Spring improvement (3 x) | PM | - | - |
| MI 03 | 3,800 | 8,100 | 3 sluices | 40-60,000 | - | - | Spring improvement | PM | - | - |
| MI 04 | - | - | - | - | - | - | - | - | bridge | 5-10,000 |
| MI 05 | - | - | - | - | - | - | Tubewell / handpump | 1-2,000 | - | - |
| MI 06 | 3,700 | 7,800 | 1 small sluice (or a small drainage channel) | 10-15,000 | 1 small dam | 25-40,000 | Spring improvement | PM | - | - |
| MI 07 | - | - | - | - | 1 small dam | 25-40,000 | - | - | Weir / bridge | 50-70,000 |
| MI 08 | 26,900 | 57,000 | 4 sluices | 50-80,000 | | | 1 pond | 1-3,000 | | |
| Kyein Chaung | +/- 18,000 | 35-40,000 | 3 sluices | 40-60,000 | | | | | | |
| May Lun | +/- 30,000 | 60-70,000 | To be studied | PM | | | | | | |
| MI 09 | 53,800 | 114,000 | 1 sluice<br>2 flap gates in existing sluices | 30-40,000 | Treadle pumps | PM | - | - | - | - |
| MI 09 + Thin Ga Net | 170,000 | 360,000 | Up to 12 sluices | 200-240,000 | Treadle pumps | PM | | | | |
| MI 10 | 20,730 | 44,000 | 4 sluices | 55-80,000 | - | - | Pond fencing | 200-500 | - | - |
| MI 11 | 1,400 | 3,000 | 1 sluice | 15-25,000 | | | Spring improvement / pond fencing | PM | - | - |

| | Embankments | | Sluices | | Irrigation | | Drinking water | | Other infrastructure | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Village** | **$M^3$** | **US $** | **No.** | **US $** | **Intervention** | **US $** | **Intervention** | **US $** | **Intervention** | **US $** |
| MI 11 + Sin Oe, Kha Maung Taw and Nat Shin Chaung | +/- 55,000 | 120,000 | 7 sluices | 80-140,000 | | | | | | |
| MI 12 | | | | | | | 1 pond, possibly spring repair | 3-5,000 | | |
| MI 13 | 12,750 | 27,000 | 3 sluices | 40-60,000 | Treadle pumps | PM | Spring improvement (2x) | PM | | |
| MI 14 | - | - | - | - | - | - | - | - | - | - |
| MI 15 | 1,650 | 3,500 | - | - | - | - | Pond improvement | 1-2,000 | - | - |
| MI 16 | | | | | Irrigation weir | 40-60,000 | | | | |
| MI 17 | 5,700 (possibly double) | 12,000 (possibly double) | 1 sluice (or renovation of existing sluices) | 15-25,000 | - | - | Spring improvement | PM | - | - |
| MI 18 | 44,000 | 93,000 | 3 sluices | 40-60,000 | | | | | | |
| MI 19 | 7,100 | 15,000 | 3 sluices | 40-60,000 | - | - | - | - | - | - |
| MI 20 | 25,500 | 54,000 | 2 sluices (or renovation of existing sluicesand 1 new sluice) | 30-40,000 | - | - | - | - | - | - |
| **Total** | | **588-953,000** | | **470-1,020,000 +PM** | | **90-140,000 + PM** | | **6-14,000 +PM** | | **55-80,000** |
| **Total priority** | | **296-308,000** | | **320-580,000** | | **40-60,000** | | **5-11,000 +PM** | | **55-80,000** |