

Tat Lan Hydrological Masterplan

Volume V: Kyaukpyu Township

Yangon
May 2013



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6 KYAUKPYU TOWNSHIP

6.1 OVERVIEW

In Kyaukpyu Township, a total of 62 villages were selected for the Tat Lan program. These are presented (with updated population figures and some additional comments) in the table below.

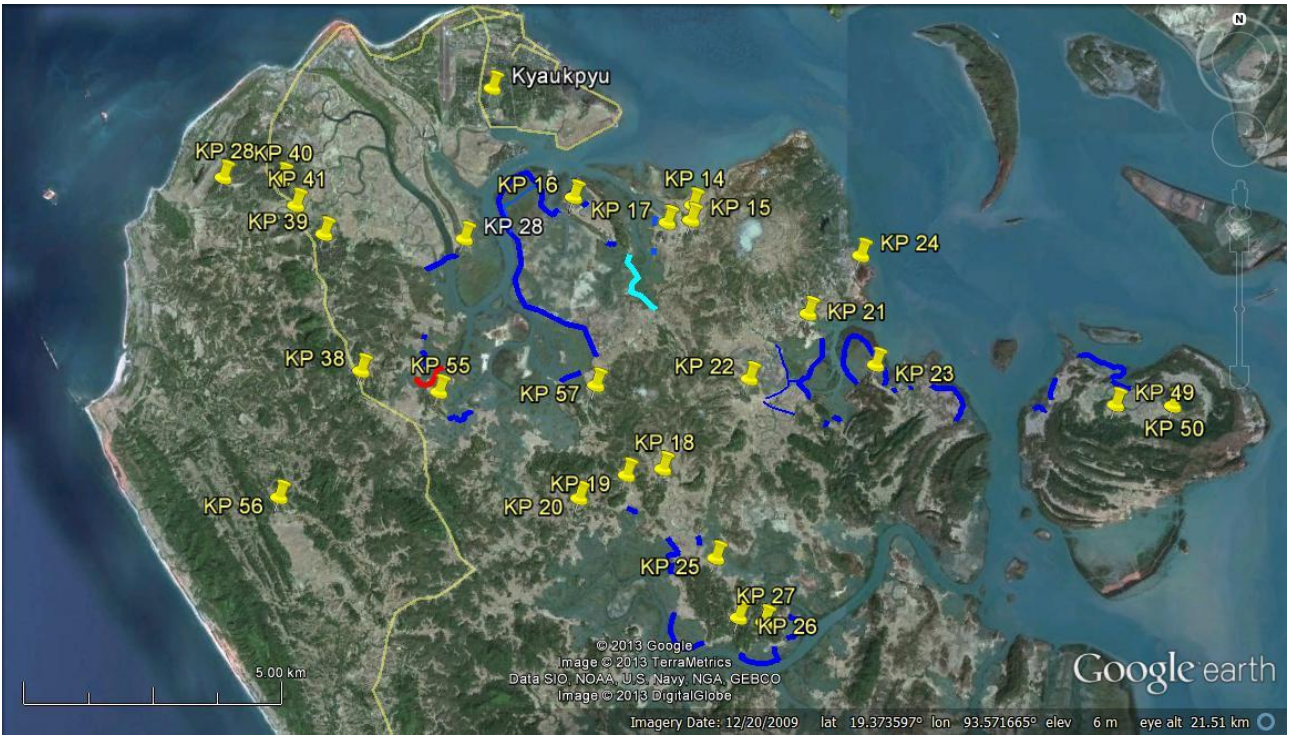
Sr	Township	Village Tract	Village Name	# HH	POP TOT	Ethnicity (Rakhine, Muslim, Chin)	Vill_Pcode	Comments
1	Kyaukpyu	Te Chaung	Ohn Taw			Rakhine	198729	This village was merged with KP 04, and is no longer a separate village.
2	Kyaukpyu	Te Chaung	Te Chaung	82	365	Rakhine	198726	
3	Kyaukpyu	Te Chaung	Kat Tu Chaing	220	1,466	Rakhine	198731	
4	Kyaukpyu	Te Chaung	Gone Taung	155	807	Rakhine	198730	
5	Kyaukpyu	Te Chaung	Pyin Wun	34	162	Rakhine		
6	Kyaukpyu	Thea Chaung	Thea Chaung	330	1,207	Rakhine	198474	
7	Kyaukpyu	Thea Chaung	U Gar Hton	86	382	Rakhine	198476	The population is less than on the original list. This village is in a different location from where it was indicated on the MIMU map
8	Kyaukpyu	Thea Chaung	Taung Nyo	31	128	Rakhine		This village is in a different location from where it was indicated on the MIMU map
9	Kyaukpyu	Thea Chaung	Pauk Net Chay	114	343	Rakhine	198477	This village has two hamlets that are about ¾ mile apart.
10	Kyaukpyu	Thea Tan	Thea Tan	76	252	Rakhine	198470	This village is in a different location from where it was indicated on the MIMU map The population of this village is reducing.
11	Kyaukpyu	Thea Tan	Kon Baung	91	420	Rakhine	198471	This village is in a different location from where it was indicated on the MIMU map
12	Kyaukpyu	Thea Tan	Let Nyot Ngon	35	115	Rakhine	198473	This village is in a different location from where it was indicated on the MIMU map
13	Kyaukpyu	Thea Tan	Tan Kha Yoe	63	244	Rakhine	198472	This village is in a different location from where it was indicated on the MIMU map
14	Kyaukpyu	Saing Chon	Saing Chon (North)	92	370	Rakhine	198540	
15	Kyaukpyu	Saing Chon	Saing Chon (South)	129	477	Rakhine	198539	

Sr	Township	Village Tract	Village Name	# HH	POP TOT	Ethnicity (Rakhine, Muslim, Chin)	Vill_Pcode	Comments
16	Kyaukpyu	Saing Chon	Saing Chon Dwain	74	317	Rakhine	198542	The population is less than in the original list
17	Kyaukpyu	Saing Chon	Saing Chon Ywar Thit	125	451	Rakhine	198541	
18	Kyaukpyu	Kyat Tein	Kyat Tein	143	678	Rakhine	198521	The population of this village has slightly reduced
19	Kyaukpyu	Kyat Tein	Tha Pyu Taung	47	245	Rakhine	198522	
20	Kyaukpyu	Kyat Tein	Tha Hpan Khar	20	110	Rakhine	198523	
21	Kyaukpyu	Sit Taw	Sit Taw	128	600	Rakhine	198524	
22	Kyaukpyu	Sit Taw	Say Maw	270	1,100	Rakhine	198525	
23	Kyaukpyu	Sit Taw	Chan Chein	104	525	Rakhine	198526	
24	Kyaukpyu	Sit Taw	Thit Poke Taung	126	515	Rakhine	198527	The population of this village has slightly reduced.
25	Kyaukpyu	Doe Ma Taung	Pyin Lal Khaung	9	34	Rakhine	198538	This village (19.339 N / 93.584 E) is in a different location from what is indicated on the revised Tat Lan list (19.329 N / 93.602 E).
26	Kyaukpyu	Doe Ma Taung	Kwan Chein or Doe Mataung	91	344	Rakhine	198536	
27	Kyaukpyu	Doe Ma Taung	Taung Hmaw	37	149	Rakhine	198537	
28	Kyaukpyu	Gone Chein	Aung Zay Ti	26	76	Rakhine	198488	This village (19.394 N / 93.538 E) is in a different location from what is indicated on the MIMU map (19.404 N / 93.493 E).
29	Kyaukpyu	Kin Myauk	Kin Ywar Gyi	120	550	Rakhine	198618	This village was taken together with Thea Khan Pyin. The two villages were taken together about 40 years ago, and have been renamed as 'Aung Zay Ya'.
30	Kyaukpyu	Kin Myauk	Laung Chwain	79	395	Rakhine	198620	This village has two times more women than men, which seems indicative of labour migration
31	Kyaukpyu	Kin Myauk	Kin Myauk	74	380	Rakhine	198619	
32	Kyaukpyu	Ka Lant Te	Kon Baung	105	422	Rakhine	198598	The village has fewer people than in the original list
33	Kyaukpyu	Kyauk Taung Pyein	Kyauk Taung Pyein	104	410	Rakhine	198649	The village has shrunk a little.
34	Kyaukpyu	Kyauk Taung Pyein	Chaung Net	130	480	Rakhine	198650	The village has a lot less people than in the original

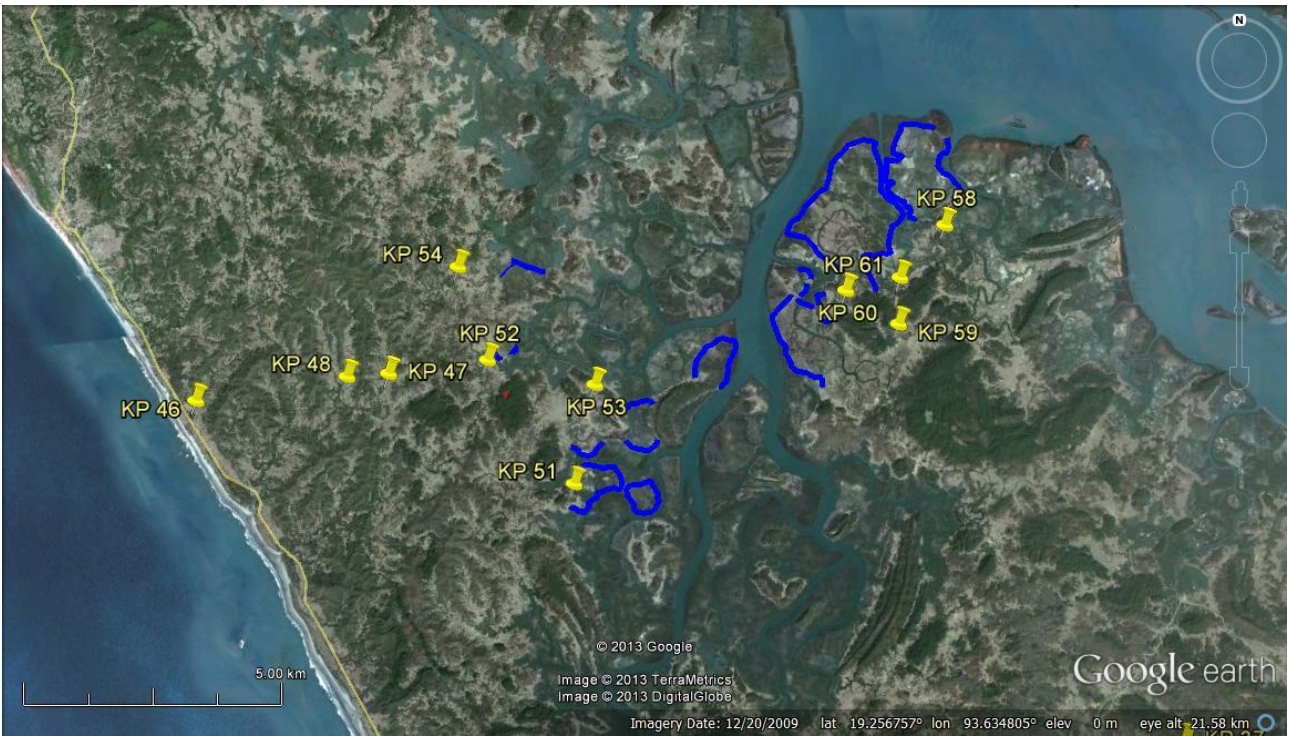
Sr	Township	Village Tract	Village Name	# HH	POP TOT	Ethnicity (Rakhine, Muslim, Chin)	Vill_Pcode	Comments
								list.
35	Kyaukpyu	Ku Lar Kyan	Ah Wa Pyin North	70	370	Rakhine	198653	This village has fewer people than in the original list.
36	Kyaukpyu	Ku Lar Kyan	Taw Lel	44	165	Rakhine	198652	This village has fewer people than in the original list.
37	Kyaukpyu	Sa Ne Min Pyin	Chin Min Pyin	160	652	Rakhine	198647	This village has grown substantially.
38	Kyaukpyu	Ohn Taw	Pyaing Seik Kay	157	625	Rakhine	198489	
39	Kyaukpyu	Ohn Taw	Wut San	250	1,020	Rakhine	198490	
40	Kyaukpyu	Ohn Taw	Kyauk Tin Seik	54	176	Rakhine	198492	The village has a little less population than indicated in the list.
41	Kyaukpyu	Ohn Taw	Kone Baung	192	770	Rakhine	198493	
42	Kyaukpyu	La Har Gyi	La Har Gyi	30	111	Rakhine	198715	This village has fewer people than in the original list.
43	Kyaukpyu	La Har Gyi	Ywar Thit Kay	125	552	Rakhine	198716	
44	Kyaukpyu	La Har Gyi	Nga Hpyin Thet	45	179	Rakhine	198718	This village has a slightly smaller population than on the original list.
45	Kyaukpyu	La Har Gyi	Aung Thar Yar	69	281	Rakhine		This village is in a different location from where it was indicated on the MIMU map
46	Kyaukpyu	Kyauk Pyauk	Pyu Chaing	40	250	Rakhine	198516	This village has fewer people than in the original list.
47	Kyaukpyu	Kyauk Pyauk	Nga Taung Nga Pyin	15	88	Rakhine		This village has fewer people than in the original list. It can be found at 19.253 N / 93.586 E.
48	Kyaukpyu	Kyauk Pyauk	Tha Hpan Chaung	104	550	Rakhine	198513	The population is slightly less than in the original list.
49	Kyaukpyu	Ma Day Kyun	Kyein Chaung/Pyai Ywa	350	1,553	Rakhine	198480	The village has increased substantially because of a Chinese petroleum / gas construction company
50	Kyaukpyu	Ma Day Kyun	Ma Day Kyun Ywar Ma	218	868	Rakhine	198478	
51	Kyaukpyu	Nga Lone Su	Ah Wa Taung	24	68	Rakhine	198584	The population is less than in the original list.
52	Kyaukpyu	Nga Lone Su	Nga Lone Su (Lower)	162	512	Rakhine	198575	The population is a little less than in the original list.
53	Kyaukpyu	Nga Lone Su	Kyauk Chein	158	670	Rakhine	198583	The population is less than in the original list
54	Kyaukpyu	Nga Lone Su	Gant Gaw	130	497	Rakhine	198582	The population is

Sr	Township	Village Tract	Village Name	# HH	POP TOT	Ethnicity (Rakhine, Muslim, Chin)	Vill_Pcode	Comments
								less than in the original list.
55	Kyaukpyu	Kan Dee	Kan Dee	75	288	Rakhine	198494	Kan Dee is at a different location (19.353 N / 93.530 E) from what is indicated in the list.
56	Kyaukpyu	Kan Dee	Hnget Pyaw Chaung	13	54	Rakhine	198498	
57	Kyaukpyu	Kat Tha Pyay	Kat Tha Pyay	110	390	Rakhine	198518	The population of this village has reduced
58	Kyaukpyu	Wa Pyay	Wa Pyay	122	511	Rakhine	198668	This village has grown quite a lot.
59	Kyaukpyu	Wa Pyay	Ma Au Pyein	132	586	Rakhine	198669	
60	Kyaukpyu	Wa Pyay	War Taung	71	326	Rakhine	198671	This village has grown quite a lot.
61	Kyaukpyu	Wa Pyay	Let Wea Tet	27	111	Rakhine	198670	
62	Kyaukpyu	Ya Ta Na	Ah Nauk Hmyar Tein	75	301	Rakhine	198685	

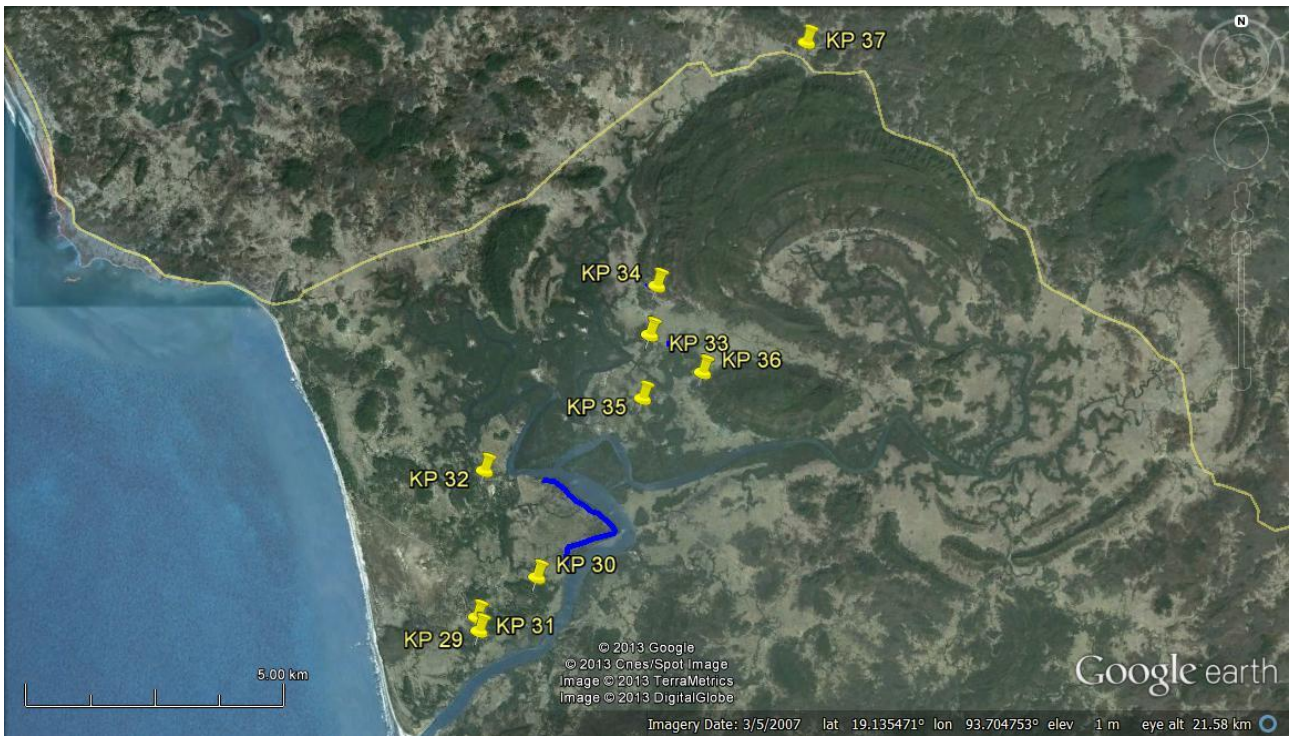
Some of the villages are found in clusters (see maps below). These villages will be grouped together. Others are not near other Tat Lan villages. These villages will be treated separately. In the remainder of the chapter, the villages will be presented as they are found north to south, and west to east. The blue lines are embankments that need to be repaired. Where village markers are in orange, their location is different from what was indicated in the Tat Lan village list for Kyaukpyu.



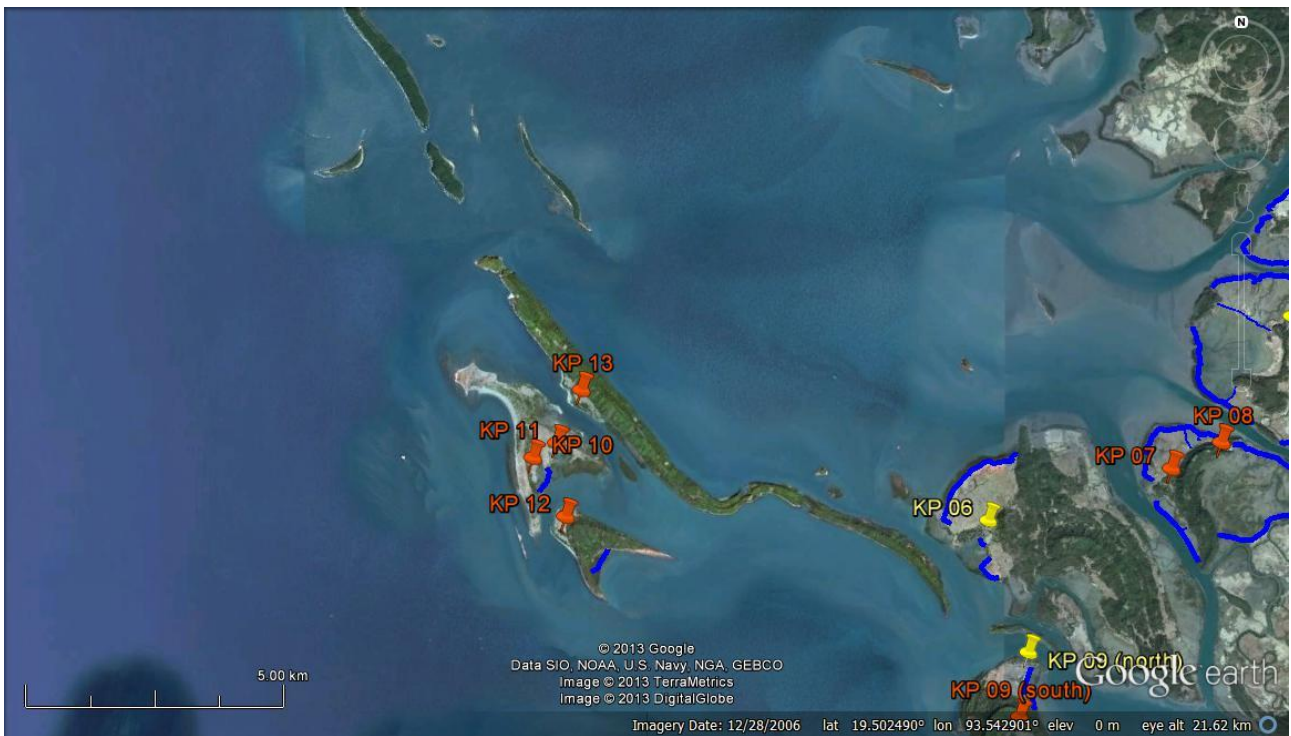
Map 1. Villages in north-western Kyaukpyu



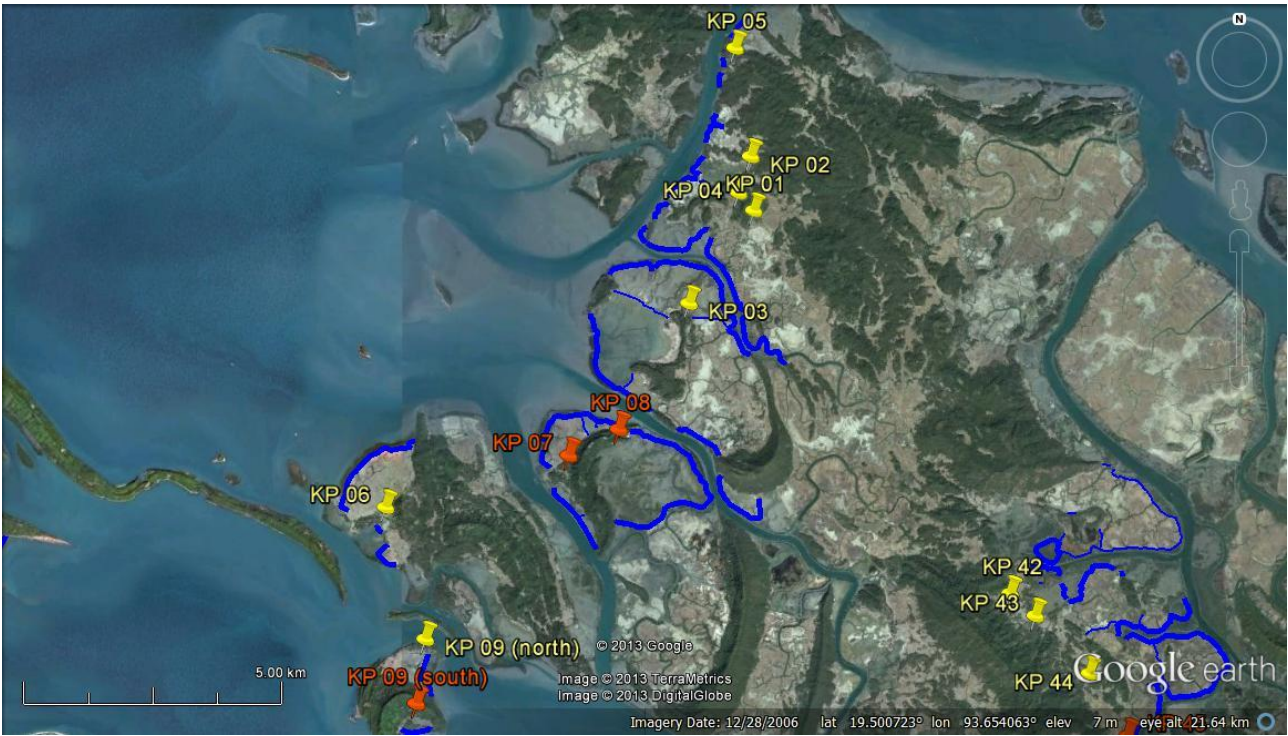
Map 2. Villages in central-western Kyaukpyu



Map 3. Villages in south-western Kyaukpyu



Map 4. Villages in north-central Kyaukpyu



Map 5. Villages in north-eastern Kyaukpyu



Map 6. Villages in central-eastern Kyaukpyu

6.2 NORTH-WESTERN KYAUKPYU

Kyaukpyu Township covers the northern half of a large island in the west, one large cluster of islands (separated only by creeks) in the east, and some small islands in the bay between the two. consists of two large islands with a few small islands in between. The north-western part of Kyaukpyu covers the area around Kyaukpyu Town. The landscape is mostly gently rolling, interspersed by rock outcrops and creeks. Paddy areas are mostly much above sea level, except along the creeks. South-east of Kyaukpyu Town, there is a small but active volcano. The area southwest of Kyaykpyu Town can be reached by motorbike, the rest must be reached by boat.

6.2.1 WUT SAN (KP 39), AUNG ZAY TI (KP 28), KYAUK TIN SEIK (KP 40), KONE BAUNG (KP 41)

Number	Township	Village Tract	Village
KP 39	Kyaukpyu	Ohn Taw	Wut San
Introduction			
Wut San has 250 households. 160 farmers grow 800 acres of paddy. 165 farmers grow about 80 acres of winter crops. There are 18 fishermen. The other households are dependent on casual labour.			
Embankments			
There is one embankment between Wut San and Aung Zay Ti (KP 28) that protects Ohn Taw VT and part of Gone Chein VT against saltwater infiltration. This embankment must be raised by 2'. Its crest width is about 13' at the moment. This is because the embankment was made with heavy machinery, and because the soil is a mix of sand and clay. This makes a wider crest width necessary to prevent saltwater percolating through the embankment. Because the embankment is already up to spring high tide level and because it functions well (its only problem is that there is no freeboard and that the sluices are not in good condition), there is no need to adjust the existing embankment. Simply adding soil on top is enough. With 1:1 sideslopes and an additional height of 2', the crest width will still be 9' after rehabilitation, which is enough for local transport purposes. This will require about 40,500 ft ³ of work (1,150 m ³). This will cost about 1.9 million MMK (2,300 USD).			
Sluices			
Wut San is located on the boundary of Tidal Zone I and II. The embankment has a catchment area of about 3,500 acres, of which about 30% is low-lying. This means that 3,500 / 450 ~ 8 sluice openings are needed. The embankment has three masonry sluice structures with flap gates: two with two 5' wide openings each, and one with four 7' wide openings. That is enough for this embankment. No additional sluices are needed. However, all three structures are damaged and need repairs.			
Drinking water			
The village has 14 open wells. There is enough drinking water throughout the year.			
Irrigation			
About 80 acres are currently irrigated from wells. It is not clear whether or not there is potential for expanding this area.			
Other			
N/A			

Number	Township	Village Tract	Village
KP 28	Kyaukpyu	Gone Chein	Aung Zay Ti
Introduction			
This village has 26 households. 14 farmers cultivate 42 acres of paddy, three households depend on fishing, and 9 households depend on casual labour. An outsider has bought land to the southeast of the village to grow mangrove trees.			
Embankments			
See KP 39.			
Sluices			
See KP 39.			
Drinking water			
The village has two ponds, and one well. There is a water shortage at the end of the dry season. People then ration the available water. The second pond is a little lower than the first pond, and the water is a little salty. Deepening therefore does not seem to be an option. People asked for enlargement of the first pond, which is quite small.			

Number	Township	Village Tract	Village
KP 28	Kyaukpyu	Gone Chein	Aung Zay Ti
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 40	Kyaukpyu	Ohn Taw	Kyauk Tin Seik
Introduction This village has 54 households. Nine households cultivate 35 acres of paddy, and six households grow 4.5 acres of winter crops. There is one fisherman, and 45 households depend on casual labour.			
Embankments See KP 39.			
Sluices See KP 39.			
Drinking water The village has nine brick wells and seven tubewells. It has enough water throughout the year.			
Irrigation There is some irrigation of winter crops from wells and from creeks. It is not clear if this acreage can be expanded.			
Other N/A			

Number	Township	Village Tract	Village
KP 41	Kyaukpyu	Ohn Taw	Kone Baung
Introduction This village has 192 households. 75 farmers grow 300 acres of paddy and 40 acres of winter crops. There are two fishermen, and 115 households depend on casual labour.			
Embankments See KP 39.			
Sluices See KP 39.			
Drinking water The village has enough drinking water throughout the year. There are 28 open wells and 3 tubewells in the village.			
Irrigation The winter crops are irrigated from wells and creeks. It might be possible to slightly expand this area if the Wut San embankment and sluices are renovated.			
Other N/A			

6.2.2 SAING CHON DWAIN (KP 16)

Number	Township	Village Tract	Village
KP 16	Kyaukpyu	Saing Chon	Saing Chon Dwain
Introduction Saing Chon Dwain has 74 households. 67 households cultivate 85.4 acres of paddy. There are six fishermen and four households dependent on casual labour.			

Number	Township	Village Tract	Village
KP 16	Kyaukpyu	Saing Chon	Saing Chon Dwain
Embankments			
<p>West of the village, an embankment protected about 700 acres of paddy land that were cultivated by 50 farmers. This embankment was badly damaged when land was converted into prawn ponds, but except for one, these prawn ponds have not been in operation for about ten years already. Villagers want to repair the embankment and take the fields into use for paddy cultivation again. The area is protected to the north-west by an embankment of about 19,700 feet long that people want to be renovated. At the same time, it looks like an additional embankment of about 6,000 feet long to the south-east is needed to block another creek and protect the fields from flooding from that side. A freeboard of 3' and a crest width of 5' are needed. Together, this will require about 3.1 million ft³ of work (88,700 m³). This will cost about 150 million MMK (177,000 USD).</p> <p>East of the village, there are three small embankments that protect about 50 acres of paddy and about 20 acres where villagers grow mangrove trees. These three embankments have a combined length of about 2,250 feet and need to be upgraded to an average height of 6'. This will require about 187,000 ft³ of work (5,300 m³). This will cost about 9.0 million MMK (10,600 USD).</p>			
Sluices			
<p>In the embankment west of the village, the Irrigation Department constructed a brick sluice with three 6' openings about twenty years ago. This sluice was damaged by undermining and outflanking and is not functional anymore. The embankment has a total catchment area of around 1,000 acres. Being located on the boundary of Tidal Zones II and III and having 75-80% low-lying area, a total of three sluice openings should be enough. The sluice thus was big enough. A new structure of similar size to the original one should be constructed in its place, but with flap gates and with proper attention for the foundation and wing walls.</p> <p>Each of the small embankments needs a single sluice of the design for Tidal Zone III. Because the mangrove trees normally need saltwater, it might be good to keep this sluice opening open on the top and without a flap gate, but with provision for a sliding gate.</p>			
Drinking water			
<p>The village has four ponds, which dry up in March. People get through the rest of the dry season by rationing water. If the ponds are enlarged (and, if possible without hitting salt water, deepened), the water problem can be resolved. Also, about 2 acres of winter crops are irrigated from the ponds. Cutting back the irrigated area by 10-20% will already substantially increase the availability of drinking water.</p>			
Irrigation			
<p>There is no possibility for expanding the irrigated area.</p>			
Other			
<p>N/A</p>			

6.2.3 SAING CHON (NORTH) (KP 14), SAING CHON (SOUTH) (KP 15), SAING CHON YWAR THIT (KP 17)

Number	Township	Village Tract	Village
KP 14	Kyaukpyu	Saing Chon	Saing Chon (North)
Introduction			
<p>Saing Chon (North) is located on the slopes of a low, but active volcano. Twenty years ago it erupted for the last time, and then it destroyed much of the village's paddy land. The village is poor. There are 92 households in the village. 62 farmers cultivate 160 acres of paddy. 10 acres of winter crops are grown by 20 farmers. There are nine fishermen, and 21 households dependent on casual labour.</p>			
Embankments			
<p>N/A: The village has no low-lying paddy fields and thus no embankments.</p>			
Sluices			
<p>N/A</p>			
Drinking water			
<p>The village has only one pond, which dries up in April. The army helps by refilling the pond, but otherwise people take water from Saing Chon (South), which is less than 500 metres away. People requested for support to enlarge the pond.</p>			

Number	Township	Village Tract	Village
KP 14	Kyaukpyu	Saing Chon	Saing Chon (North)
Irrigation			
The winter crop fields are irrigated from small wells that are dug near these fields, and on residual soil moisture. There is no opportunity for expanding irrigation.			
Other			
N/A			

Number	Township	Village Tract	Village
KP 15	Kyaukpyu	Saing Chon	Saing Chon (South)
Introduction			
The village has 129 households. 60 farmers cultivate 110 acres of paddy; 20 farmers also cultivate 10 acres of winter crops. There are 17 fishermen. 60 households depend on casual labour. This village is also on the side of the volcano mentioned for KP 14.			
Embankments			
N/A: The village has no low-lying paddy fields and thus no embankments.			
Sluices			
N/A			
Drinking water			
The village has six ponds and one well that always carries water. The water of one pond and the well is shared with adjoining villages when these villages do not have enough water. Several of the ponds dry up during the dry season, and in very dry years there is a shortage in this village as well. The last time this happened (5 years ago), people took water from a large pond in a nearby army compound. Tubewells are not feasible, as the deeper aquifers are all salty.			
Irrigation			
People suggested that a valley ½ mile east of the village is a good location to construct a small irrigation reservoir. While the topography is indeed very suitable, Google Earth imagery shows that the stream blocked by the proposed dam carries mud from the volcano crater. It is therefore likely that the reservoir will fill up very soon, and may pose a risk to downstream areas if there is another eruption. For this reason, it is not recommended to do anything here.			
Other			
N/A			

Number	Township	Village Tract	Village
KP 17	Kyaukpyu	Saing Chon	Saing Chon Ywar Thit
Introduction			
This village has 125 households. 37 farmers cultivate 111 acres of paddy and 1 acre of winter crops (and besides, many households have small vegetable plots next to their houses). There are 28 fishermen, and 63 households dependent on casual labour.			
Embankments			
North and south of the village, there are two small embankments with a total length of about 1,100'. Each embankment protects a couple of acres of paddy fields against saltwater intrusion. These embankments need to be raised by about 1'6" to an average height of 5' and 7', respectively. This will require about 71,600 ft ³ of work (2,000 m ³). This will cost about 3.4 million MMK (4,000 USD).			
Sluices			
The southern embankment has a sluice that is big enough. It needs some repairs, and must be fitted with a flap gate. The northern embankment does not have any sluices. This embankment needs to be fitted with a single concrete culvert (2' diameter should be enough)			
Drinking water			
The village has only one pond, which dries up in March. The Navy provides water when this happens, and people go to Saing Chon (South) as well. People indicated water as the biggest problem of the village, and asked for support to enlarge the pond.			
Irrigation			
It might be possible to stock up some water behind the embankments and use treadle pumps to irrigate surrounding fields.			
Other			
N/A			

6.2.4 THIT POKE TAUNG (KP 24), SIT TAW (KP 21), SAY MAW (KP 22), CHAN CHEIN (KP 23)

Number	Township	Village Tract	Village
KP 24	Kyaukpyu	Sit Taw	Thit Poke Taung
Introduction This village has 126 households, and is mostly a fishing village. There are 63 fishermen. Paddy cultivation is done by 28 farmers on 40 acres. 35 households depend on casual labour.			
Embankments N/A			
Sluices N/A			
Drinking water The village has three ponds that are quite small in size. They dry up in April, and people then go to the neighbouring Navy base to collect water. One of the ponds will be upgraded soon by Better Life Organisation. It might be good to enlarge (and especially to deepen) the other two ponds as well.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 21	Kyaukpyu	Sit Taw	Sit Taw
Introduction This village has 128 households. There are 68 fishermen. 60 of these households also cultivate 100 acres of paddy. There are 60 households that depend on casual labour.			
Embankments The fields of Sit Taw and Say Maw (including an area that was in use before but that is currently abandoned) can be protected by an embankment of about 4,600 feet long. This embankment needs to have an average height of 6' (on the Sit Taw side) to 8' (on the Say Maw side). Crest width must be 4', and freeboard 2'. To the south-east, another short embankment of about 800' long is needed to keep saltwater out. This embankment also protects some fields of Chan Chein village (KP 23). This embankment must be upgraded to an average height of 5', with a crest width of 4'. Together, this will require about 452,000 ft ³ of work (12,800 m ³). This will cost about 21.7 million MMK (25,500 USD). The fields of the two villages are separated by embankments that do not need to be upgraded if the outer embankment is repaired.			
Sluices The two embankments together have a catchment area of about 2,100 acres. The area is located in Tidal Zone II. About 30% of the catchment area is low-lying. This means that a total of 2,100 / 330 ~ 6.4 sluice openings of the proposed standard design for Tidal Zone II are needed. There are two sluice structures in the large embankment: one has three 6' wide openings, and the other has two 6' wide openings. The small embankment has another sluice with a single opening. This is sufficient. The first sluice needs to be cleaned and fitted with flap gates. The other two structures do not need any work.			
Drinking water This village has five ponds that all dry up in April. People then take water from a pond on a nearby Navy base. People have asked for enlarging one of the ponds. This may help, but because the ponds are quite deep, seepage seems to be a problem. If that is the case, it is more efficient to provide lining to one or more ponds instead of enlarging a pond.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 22	Kyaukpyu	Sit Taw	Say Maw
Introduction Say Maw has 270 households. There are 145 farmers, who cultivate 700 acres of paddy. There are 34 fishermen. 51 households depend on casual labour.			
Embankments See KP 21.			

Number	Township	Village Tract	Village
KP 22	Kyaukpyu	Sit Taw	Say Maw
Sluices See KP 21.			
Drinking water The village has four ponds, of which three dry up between February and April. When there is a shortage, the Navy gives some water. Seepage seems to be a problem, because the ponds are quite deep and should have enough volume to provide more than enough water. If that is the case, it would be good to provide lining to one or more ponds.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 23	Kyaukpyu	Sit Taw	Chan Chein
Introduction Chan Chein has 104 households. 70 farmers cultivate about 139 acres. The other 34 households depend on casual labour.			
Embankments There are three embankments near the village. The first, to the southeast of the village, has three parts and a total length of 5,500 feet. This embankment protects about 100-120 acres of low-lying paddy fields. This embankment must be upgraded to an average height of 6', and be given a crest width of 4'. This will require about 355,000 ft ³ of work (10,000 m ³). This will cost about 17 million MMK (20,000 USD). The second embankment is discussed under KP 21. The third embankment is about 6,900 feet long, and protects an area of about 100 acres that used to be paddy land. This land was turned into a prawn pond by the Navy. It was then handed over to someone from Sittwe, who has abandoned it a couple of years ago because of lack of profits. The villagers have approached the navy to return the land, but this is still under discussion. If the land is returned, it can be taken into use for paddy cultivation again. If that happens, the embankment will need to be renovated to an average height of 7' and a crest width of 4'. This will require about 827,000 ft ³ of work (23,400 m ³). This will cost about 39.7 million MMK (46,700 USD).			
Sluices This area is in Tidal Zone II. The first embankment has one sluice structure with three openings of 3' wide and 5' high. This is roughly equivalent to two sluice openings of the design for Tidal Zone III. The embankment has a catchment area of about 350 acres, of which 35% is low-lying. This means that a single sluice of the type for Tidal Zone II is enough, or four sluices of the type for Tidal Zone III. It is probably cheapest to add a single structure with two openings of the proposed standard design for Tidal Zone III (with sluice openings of 5' or 6'). The second embankment is discussed under KP 21. The third embankment has a catchment area of about 110 acres, of which 90% is low-lying. A single sluice opening of the type for Tidal Zone III (with a sluice height of 5' or 6') should be enough for this.			
Drinking water The village has three ponds, of which two dry up at the end of the dry season (despite being quite deep). During such periods, people take water from a spring that is about a mile from the village. It looks like seepage is a problem here. If that is the case, lining will be the best solution.			
Irrigation There is no irrigation at the moment. If the embankments are renovated, it might be possible to introduce treadle pumps near the creeks.			
Other N/A			

6.2.5 KHAT THA PYAY (KP 57)

Number	Township	Village Tract	Village
KP 57	Kyaukpyu	Khat Tha Pyay	Khat Tha Pyay
Introduction			
Kat Tha Pyay has 110 households. 35 farmers cultivate 105 acres of paddy. There are 15 fishermen. 60 households are dependent on casual labour.			
Embankments			
About four years ago, villagers have started constructing an embankment to block off almost 40 acres of tidal land that can be turned into paddy fields, but they need external support to bring it up to standard. This embankment is almost 1,400 feet long, and will also protect the village against flooding. It must be upgraded to 2' above spring high tide level, which means that the average height will be 7'6". The crest width must be 3'. This will require about 154,000 ft ³ of work (4,400 m ³). This will cost about 7.4 million MMK (8,700 USD).			
Sluices			
The embankment is in Tidal Zone II, and has a catchment area of about 110 acres, of which about 35-40% is low-lying. A single sluice opening of the proposed design for Tidal Zone III (with a sluice height of 5' or 6') is enough.			
Drinking water			
The village has five ponds. During dry years, there is no source of freshwater nearby, and people come from Kyaukpyu to bring freshwater. Some of the ponds are shallow, and it might be possible to deepen them. However, even the deeper ponds dry up, which means that seepage losses are probably an issue. If that is the case, lining of at least two ponds will be needed.			
Irrigation			
N/A			
Other			
N/A			

6.2.6 PYAING SEIK KAY (KP 38), KAN DEE (KP 55)

Number	Township	Village Tract	Village
KP 38	Kyaukpyu	Ohn Taw	Pyaing Seik Kay
Introduction			
Pyaing Seik Kay has 157 households. 109 farmers cultivate 436 acres of paddy. 17 acres of winter crops are grown by 34 owners. There are 14 fishermen, and 48 landless households. There is also 15 acres of nipa palm plantation.			
Embankments			
The village has two small embankments with a combined length of 1,300'. Each encloses several dozen acres of land that can be used for paddy cultivation. The embankments must be upgraded to an average height of 7' to 7'6", and be given a crest width of 4'. This will require about 146,000 ft ³ of work (4,100 m ³). This will cost about 7.0 million MMK (8,300 USD).			
Sluices			
The northern embankment has a catchment area of about 300 acres; the southern embankment has a catchment area of about 170 acres. In both catchment areas, about 30% of the land is low-lying. This area is located in Tidal Zone II, which means that the northern embankment needs a single sluice opening of the design for Tidal Zone II. This embankment already has a sluice with two openings. No additional works are needed other than replacing the flap gates. For the southern embankment, a sluice with two openings of the design for Tidal Zone III is the cheapest option.			
Drinking water			
This village has two ponds. One dries up in March, the other in April. There is also one well. At the end of the dry season, there is not enough water, and people go to a spring two miles away across some hills. The ponds are large and deep. This indicates that the main problem is not the size of the pond, but seepage losses. Probably the best solution for the drinking water shortage in this village is lining of one or both ponds.			
Irrigation			
N/A			
Other			
N/A			

Number	Township	Village Tract	Village
KP 55	Kyaukpyu	Kan Dee	Kan Dee
Introduction			
Kan Dee has 75 households. 43 farmers grow 90 acres. There are three fishermen.			
Embankments			
East of the village, there is an embankment of 1,950 feet that keeps the saltwater away from the paddy fields. This embankment was damaged by Nargis in 2008 and by Giri in 2010. It needs to be upgraded to an average height of 6'6" (2 feet above spring high tide, with a crest width of 4'). This will require about 172,500 ft ³ of work (4,900 m ³). This will cost about 8.3 million MMK (9,700 USD).			
Sluices			
This area is in Tidal Zone II. The embankment has a catchment area of about 550 acres, of which about 20% is low-lying. This means that two sluice openings of the design for Tidal Zone II need to be added. There is currently only a channel of 15' on the western end of the embankment, without a sluice structure. One structure with two openings can be constructed in this channel.			
Drinking water			
The village has two ponds, of which one was constructed in early 2013. The other pond dries up halfway through the dry season, and the village used to face a severe water shortage. There is however drinking water available in Min Tat Taung village, about 15 minutes walking from Kan Dee. If seepage is a problem (this is quite likely), then it is to be expected that the new pond will also dry up. If that is the case, lining needs to be provided. Before anything is done, a re-assessment of the drinking water situation in the village must be done in early 2014, after the new pond has been able to prove itself.			
Irrigation			
N/A			
Other			
N/A			

6.2.7 HNGET PYAW CHAUNG (KP 56)

Number	Township	Village Tract	Village
KP 56	Kyaukpyu	Kan Dee	Hnget Pyaw Chaung
Introduction			
This is a small village with only 13 households. 10 households cultivate 20 acres of paddy, while the other three households depend on casual labour.			
Embankments			
N/A: this village does not have low-lying fields.			
Sluices			
N/A			
Drinking water			
The village has two ponds and one location proposed for construction of a third pond. The existing ponds dry up in March, after which people collect water from Kalabar village, about 3 miles away. The existing ponds are small, and it will be good to deepen and enlarge them. If seepage is a problem, at least one of the ponds should be lined.			
Irrigation			
N/A			
Other			
N/A			

6.2.8 KYAT TEIN (KP 18), THA PYU TAUNG (KP 19), THA HPAN KHAR (KP 20)

Number	Township	Village Tract	Village
KP 18	Kyaukpyu	Kyat Tein	Kyat Tein
Introduction			
This village has 143 households. Some people have migrated to Kyaukpyu to look for work. 113 farmers cultivate 360 acres of paddy. Winter crops are grown on 7 acres by 60 farmers. There is 1 fisherman, and 17 landless households. The mangrove forests of the village have been sold to Chinese and local traders.			

Number	Township	Village Tract	Village
KP 18	Kyaukpyu	Kyat Tein	Kyat Tein
Embankments East of the village, there is a creek that has two mouths which are blocked by embankments. Together, these embankments are 1,600 feet long. They protect an area of about 100 acres of low-lying paddy fields. The embankments were renovated by MHDO in 2011 and are up to spring high tide level, but have no freeboard and the sideslopes are too steep. It would be good if these embankments can be raised by 2'. That will require about 94,000 ft ³ of work (2,700 m ³). This will cost about 4.5 million MMK (5,300 USD).			
Sluices There is one masonry sluice structure on a rock foundation that was constructed around 1975. It has three 6' wide openings, of which one has collapsed. The other two openings are fitted with locally made wooden flap gates. The sluices are covered by timber, and on top of that a dirt road has been constructed. The embankments are in Tidal Zone II. They have a catchment area of about 700 acres, of which about 20% is low-lying. This means that two openings should be sufficient. This means that the existing sluice must be renovated, but that no additional sluice structures need to be added.			
Drinking water The village has five ponds, but these do not carry enough water during the end of the dry season. People then dig temporary wells in the paddy fields. It might be good to either deepen the existing ponds, provide lining for one or more ponds, or construct one or two wells near the paddy fields.			
Irrigation A small area of winter crops is irrigated from wells that are dug in the fields. If the embankments are renovated, it might be possible to introduce treadle pumps for use near the creek.			
Other South of this village (and other villages nearby), a gas pipeline and a road parallel to it have been constructed. Because there are not enough culverts across this road, the village was inundated. An adequate bridge or culvert must be constructed to allow the creek east of the village to drain towards the sea. Who should do this is however not clear.			

Number	Township	Village Tract	Village
KP 19	Kyaukpyu	Kyat Tein	Tha Pyu Taung
Introduction This village has 47 households. 25 farmers cultivate 101 acres of paddy. Four of them also grow a total of 1 acre of winter crops. There are five fishermen, and 11 households dependent on casual labour.			
Embankments A small 400' long embankment protects 10-20 acres of low-lying paddy fields. The embankment was renovated in 2011 by MHDO, but is not high enough and has sideslopes that are too steep. Its height should be increased by 3' to an average height of 6'. This will require about 28,400 ft ³ of work (700 m ³). This will cost about 1.2 million MMK (1,400 USD).			
Sluices There is an existing brick sluice with two openings of 4' wide that are fitted with flap gates. This sluice must be renovated. No additional sluices need to be added.			
Drinking water The village has enough water. There are two springs on the edge of the village that give so much water that people from other villages also come to take water from them. It might be possible to construct a pipeline from the springs to the centre of the village, but this is not a priority.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 20	Kyaukpyu	Kyat Tein	Tha Hpan Khar
Introduction This small village has 20 households. 15 households grow paddy on 60 acres. 17 farmers grow winter crops on one acre. Previously, the villagers also owned mangrove forests, but these have been sold to outsiders.			
Embankments N/A: this village does not have low-lying paddy fields.			
Sluices N/A			

Number	Township	Village Tract	Village
KP 20	Kyaukpyu	Kyat Tein	Tha Hpan Khar
Drinking water The village has one pond that does not carry enough water. There is also a good spring about 30 minutes walking distance from the village. When there is a shortage, people go to Tha Pyu Taung (KP 19) for drinking water. People requested for support to enlarge the existing pond.			
Irrigation N/A			
Other N/A			

6.2.9 PYIN LAL KHAUNG (KP 25), KWAN CHEIN (A.K.A. DOE MA TAUNG) (KP 26), TAUNG HMAW (KP 27)

Number	Township	Village Tract	Village
KP 25	Kyaukpyu	Doe Ma Taung	Pyin Lal Khaung
Introduction Pyin Lal Khaung has 9 households. It is a small and very poor village. People move out of this village to other villages to find income. There are five farmers, who cultivate 10 acres of paddy. There is one fisherman. Four households depend on casual labour.			
Embankments Two short embankments are reported to protect a total of 10.5 acres of paddy. They have a combined length of 2,000 feet. Upgrading these to an average height of 5'6" will require about 116,000 ft ³ of work (3,300 m ³). This will cost about 5.6 million MMK (6,600 USD).			
Sluices These embankments have tiny catchment areas. It will be enough to construct a 3' wide sluice of the type for Tidal Zone III in the southern embankment, and a 2' diameter concrete pipe (with proper collars) in the northern embankment.			
Drinking water The village has two springs that provide enough water, as well as one very small pond. People asked for a pond near the village to reduce the time spent on collecting water.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 26	Kyaukpyu	Doe Ma Taung	Kwan Chein (also known as Doe Ma Taung)
Introduction Doe Ma Taung has 91 households. 46 farmers cultivate 94 acres of paddy. 45 farmers grow 6 acres of winter crops. 15 farmers have 4 acres of nipa palms. There are six fishermen. One household owns 10 acres of prawn ponds. Three households own 10 acres of mangrove forest.			
Embankments MHDO constructed an embankment in 2011 that encloses about 60 acres of paddy fields. This embankment is in good condition, but does not meet the proposed standards for freeboard, crest width and sideslope. The embankment is 4,200 feet long. Renovating it will require about 226,000 ft ³ of work (6,400 m ³). This will cost about 10.9 million MMK (12,800 USD).			
Sluices The embankment is in Tidal Zone II. It has a catchment area of about 120 acres, of which half is low-lying. This means that a single sluice opening of the type for Tidal Zone III is enough (but with a sluice height of 5' or 6'). There is currently a wooden sluice. This sluice is big enough, but it would be good to replace it by a masonry sluice to reduce the cost of future maintenance.			
Drinking water The village has three springs. Villagers requested for spring protection. Storage reservoirs will make it possible to capture the night flow.			
Irrigation N/A			

Number	Township	Village Tract	Village
KP 26	Kyaukpyu	Doe Ma Taung	Kwan Chein (also known as Doe Ma Taung)
Other N/A			

Number	Township	Village Tract	Village
KP 27	Kyaukpyu	Doe Ma Taung	Taung Hmaw
Introduction The village has 37 households. 12 households cultivate 36 acres of paddy. 20 households grow about 0.5 acre of winter crops. Five households own 2 acres of nipa palm. There are 5 fishermen and 14 landless households. The village as a whole owns 200 acres of mangrove forest.			
Embankments The villagers asked for the rehabilitation of two small embankments, that will extend the paddy acreage of the village with about 100 acres. These embankments have a combined length of 7,500 feet and will require about 600,000 ft ³ of work (17,000 m ³). This will cost about 28.9 million MMK (34,000 USD). It might also be possible to make a single embankment of about the same length. This will enclose an additional 30-40 acres of land that can be converted to paddy fields.			
Sluices There are currently no sluices in the two embankments. The southern embankment has a catchment area of about 92 acres (of which about 50% is low-lying); the eastern embankment has a catchment area of about 55 acres (of which about 60% is low-lying). For both, a single sluice opening of the type for Tidal Zone III is sufficient. The sluice in the eastern embankment can be 3' wide. If a single embankment is made, the total catchment area will be about 180 acres. In this case, two sluice openings of the type for Tidal Zone III will be needed.			
Drinking water The village has three springs and a well. In the dry season, there is some shortage of drinking water. People requested for a pond to increase the availability of drinking water.			
Irrigation N/A			
Other N/A			

6.2.10 KYEIN CHAUNG / PYAI YWA (KP 49), MA DAY KYUN YWAR MA (KP 50)

Number	Township	Village Tract	Village
KP 49	Kyaukpyu	Ma Day Kyun	Kyein Chaung / Pyai Ywa
Introduction Kyein Chaung has 350 households. It has grown substantially because people working for a Chinese construction company moved in. Chinese and Indian companies are working on petroleum and natural gas projects in the area. There are 230 fishermen. 28 farmers grow paddy on 140 acres. 92 families are landless.			
Embankments Most of the paddy fields belonging to this village are not affected by the sea, and some are protected by the embankment of Ma Day Kyun Ywar Ma (KP 50). There are however three short embankments that together protect about 55 acres of low-lying land. Upgrading these to an average height of 7' to 7'6" (and with a crest width of 4') will require about 690,000 ft ³ of work (19,600 m ³). This will cost about 33.1 million MMK (39,000 USD).			
Sluices Two embankments have catchment areas of about 60-80 acres each; the southernmost embankment has a catchment area of about 150 acres. About 30-50% of each catchment area is low-lying. This means that the southernmost embankment needs two sluice openings of the type for Tidal Zone III, and the other two embankments each need a single sluice opening of the type for Tidal Zone III.			
Drinking water The village has four ponds and seven wells. It has enough water throughout the year.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 50	Kyaukpyu	Ma Day Kyun	Ma Day Kyun Ywar Ma
Introduction			
The village has 218 households. There are 145 fishermen. 28 farmers grow paddy on 140 acres. 45 families are landless.			
Embankments			
A short embankment of about 1,700 feet long protects about 120 acres of low-lying paddy fields against the sea. The catchment area is substantially larger, but the other paddy fields are on the slopes of the hills. This embankment must be raised by 2'. Because the sideslopes are good and the crest width is about 20', soil only needs to be added on top of the existing embankment. That will require about 33,000 ft ³ of work (930 m ³). This will cost about 1.6 million MMK (1,900 USD).			
Suices			
There are two sluices that were dug into rock. The sluices are big enough to drain the entire area. However, the flap gates need to be replaced.			
Drinking water			
The village has enough water. It has one pond. When it dries up, people get water from Kyein Chaung (KP 49). A Chinese company that works in the area has constructed a reservoir near the village that provides water for domestic use.			
Irrigation			
N/A			
Other			
N/A			

6.3 CENTRAL-WESTERN KYAUKPYU

This area covers eleven scattered villages in two clusters: one cluster on each side of a wide creek. Not all villages have low-lying paddy fields. The area has a rolling landscape. The only low-lying fields are along the creek that separates the two clusters of villages.

6.3.1 PYU CHAING (KP 46), NGA TAUNG NGA PYIN (KP 47), THA HPAN CHAUNG (KP 48), AH WA TAUNG (KP 51), NGA LONE SU (LOWER) (KP 52), KYAUK CHEIN (KP 53), GANT GAW (KP 54)

Number	Township	Village Tract	Village
KP 46	Kyaukpyu	Kyauk Pyauk	Pyu Chaing
Introduction			
This village has 40 households. 30 households cultivate 35 acres of paddy. 10 households grow 3 acres of winter crops. 15 households engage in fishing. There are no households that depend on casual labour.			
Embankments			
N/A: this village does not have low-lying paddy fields.			
Suices			
N/A			
Drinking water			
The village has enough drinking water.			
Irrigation			
N/A			
Other			
N/A			

Number	Township	Village Tract	Village
KP 47	Kyaukpyu	Kyauk Pyauk	Nga Taung Nga Pyin
Introduction			
This village has 15 households. The population is reducing, as households are moving to Tha Hpan Chaung (KP 48) to find employment there. These households take their houses with them. 10 households grow 20.5 acres of paddy, and the whole village grows 1 acre of winter crops.			
Embankments			
N/A: this village does not have low-lying paddy fields.			
Suices			
N/A			

Number	Township	Village Tract	Village
KP 47	Kyaukpyu	Kyauk Pyauk	Nga Taung Nga Pyin
Drinking water The village has two ponds that dry up at the end of the dry season. There is one spring, about 20 minutes walking distance from the village, but it is up a steep hill and it is only used for emergency purposes. When there is a shortage of water, people go to Tha Hpan Chaung to get water. It might be good to deepen one or both of the existing ponds.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 48	Kyaukpyu	Kyauk Pyauk	Ta Hpan Chaung
Introduction The village has 104 households. 60 farmers grow 105 acres of paddy.			
Embankments N/A: this village does not have low-lying paddy fields.			
Sluices N/A			
Drinking water This village has enough drinking water.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 51	Kyaukpyu	Nga Lone Su	Ah Wa Taung
Introduction The village has 24 households. 15 households grow 20 acres of paddy. 10 households grow 2 acres of nipa palm. 4 households grow 1 acre of winter crops. This village is difficult to reach and very isolated. People are moving out of this village because they are looking for better income opportunities. There were prawn ponds in the village, but most have been abandoned and have reverted to mangrove forest.			
Embankments East of the village, there are two former prawn pond areas that can be turned into paddy fields if the embankments around them are upgraded. If the embankment closest to the village is extended, an existing paddy area can also be protected. This embankment will then be 9,800 feet long. The other embankment is about 6,700 feet long. Both must be upgraded to an average height of 6' (2' above spring high tide), and both must be given a crest width of 4'. Together, this will require about 1.2 million ft ³ of work (32,600 m ³). This will cost about 55.2 million MMK (65,000 USD). Note however that this should only be done if the villagers are genuinely interested in reviving agriculture in their village.			
Sluices There are no sluices in the embankments at the moment. The embankment closest to the village has a catchment area of about 130 acres, of which about 80% is low-lying. For this embankment, a single sluice opening of the design for Tidal Zone III (but with a sluice height of 6') is enough. The other embankment has a catchment area of about 75 acres, all of which is low-lying. For this area, a single sluice opening of the design for Tidal Zone III is enough.			
Drinking water The village has enough water. At the monastery (about 100 metres out of the village), there is a spring. Villagers have requested for a pipeline to be laid so that the water can be taken into the village.			
Irrigation N/A			
Other The village is very isolated and only accessible by boat. If there are possibilities for constructing a road (this will need to be investigated), that will help the economic development of the village.			

Number	Township	Village Tract	Village
KP 52	Kyaukpyu	Nga Lone Su	Nga Lone Su (Lower)

Number	Township	Village Tract	Village
KP 52	Kyaukpyu	Nga Lone Su	Nga Lone Su (Lower)
Introduction			
This village has 162 households. 90 farmers grow 400 acres of paddy. 10 farmers grow 2 acres of winter crops.			
Embankments			
About 15-20 acres of low-lying fields can be protected against saltwater if two short embankments are upgraded. The other fields of the village are not affected by saltwater. These embankments have a combined length of about 1,350 feet. Upgrading them to 2' above spring high tide (and with a crest width of 4') will require about 80,000 ft ³ of work (2,300 m ³). This will cost about 3.8 million MMK (4,500 USD). Because these embankments only protect a small part of the total paddy area, these embankments should probably not be a high priority.			
Sluices			
The embankments share the same catchment area, which is about 70 acres. Of this, about 30% is low-lying. A single sluice of the design for Tidal Zone III is enough here, preferably in the eastern embankment.			
Drinking water			
The village has enough drinking water.			
Irrigation			
About 500 metres southeast of the village, there is a small stream that carries water throughout the year. The villagers have tried to construct a small irrigation dam there, but were unable to complete it. The location is excellent for the development of a small reservoir that can irrigate 40-50 acres of paddy land. The embankment will be about 100' long and 20-25' high. The reservoir (including spillway, sluice and channel) will cost about 30,000-40,000 USD.			
Other			
N/A			

Number	Township	Village Tract	Village
KP 53	Kyaukpyu	Nga Lone Su	Kyauk Chein
Introduction			
This village has 158 households. 80 farmers grow 130 acres of paddy. 10 farmers grow 3 acres of winter crops. 20 households have 15 acres of nipa palms. There are 21 fishermen. 6 households own 70 acres of prawn ponds. More prawn ponds lie abandoned. Villagers would like to convert about 200 acres of prawn ponds back into paddy fields.			
Embankments			
At Kyauk Chein, four embankments need upgrading			
The first embankment lies to the southwest of the village and protects existing paddy fields. This embankment is about 2,300' long, and needs to be upgraded to an average height of 6'6". All embankments should be given a crest width of 4'.			
The second and third embankment, southeast of the village, protect an area of prawn ponds that people would like to convert into paddy fields. Together, these embankments are 4,600' long. They need to be upgraded to an average height of 6'6".			
The fourth embankment, east of the village protects an area of paddy fields and some prawn ponds that people would like to convert to paddy fields. This embankment is about 7,500' long, and needs to be upgraded to an average height of 6'6".			
Upgrading these four embankments will require about 940,000 ft ³ of work (26,600 m ³). This will cost about 45.1 million MMK (53,100 USD).			
Sluices			
The fields of Kyauk Chein are located in Tidal Zone II.			
The first embankment has a catchment area of about 400 acres, of which about 30% is low-lying. It has one brand new sluice structure with three 4' wide openings, and fitted with flap gates. That is sufficient.			
The second and third embankments share a catchment area of about 110 acres, of which about 70% is low-lying. A single concrete sluice opening of the design for Tidal Zone III needs to be constructed. There are currently a lot of wooden sluices, which can be removed.			
The fourth embankment also has a catchment area of about 110 acres, of which about 80% is low-lying. This embankment has no sluices. A single sluice opening of the design for Tidal Zone III needs to be constructed.			
Drinking water			
The village has enough drinking water. There is a spring with a good yield, that could be fitted with a pipeline to take the water straight to the village.			

Number	Township	Village Tract	Village
KP 53	Kyaukpyu	Nga Lone Su	Kyauk Chein
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 54	Kyaukpyu	Nga Lone Su	Gant Gaw
Introduction This village has 130 households. The population has reduced over the past years. 63 farmers grow 150 acres of paddy. 20 farmers grow 4 acres of winter crops. 4 farmers grow 20 acres of nipa palms.			
Embankments In order to protect the fields of Gant Gaw against the sea, a single embankment of 2,300' long needs to be renovated to an average height of 6'. The crest width should be 4'. This embankment was constructed by the Irrigation Department around the year 2000. Upgrading the embankment will require about 138,000 ft ³ of work (3,900 m ³). This will cost about 6.6 million MMK (7,800 USD). The village has an embankment committee that was already very active before Giri. The renovation of this embankment (and the sluices that come with it) should be given high priority. A second embankment proposed by the villagers is located upstream of the other embankment, and will not offer extra protection. Because of that, this embankment does not need to be renovated under Tat Lan.			
Sluices The Irrigation Department originally constructed two sluice structures, each with two openings, and fitted with flap gates. One of the structures was destroyed during Giri, but the other (with two openings of 5'6" wide) is in good condition. The embankment has a catchment area of about 760 acres, of which 20% is low-lying. Being located in Tidal Zone II, this means that 760 / 360 ~ 2.1 sluice openings are needed. The existing sluice openings are a little wider than the proposed standard design of 5', which means that the remaining sluice structure should be enough. However, if the sluice has not been placed low enough, an additional structure of the same design should be constructed.			
Drinking water The village has enough drinking water.			
Irrigation N/A			
Other N/A			

6.3.2 WA PYAY (KP 58), MA AU PYEIN (KP 59), WAR TAUNG (KP 60), LET WEA TET (KP 61)

Number	Township	Village Tract	Village
KP 58	Kyaukpyu	Wa Pyay	Wa Pyay
Introduction Wa Pyay has 122 households. 111 households cultivate 511 acres of paddy. The other 11 households are landless.			
Embankments The fields of Wa Pyay are located on two peninsulas, and are surrounded by several embankments that are connected to each other. In order to protect the fields against the sea, the outer embankment must be renovated, while the internal embankments that separate clusters of fields from each other can be repaired at a later stage as the farmers see fit. Part of the area protected by these embankments is currently in use as prawn ponds, but the owners want to convert it back to paddy fields. The outer embankment on the western peninsula can be constructed as one long stretch. The outer embankment on the eastern peninsula consists of two stretches, separated by hills. The total length of these embankments is about 42,000 feet. Upgrading these embankments to a level 2' above spring high tide, and to a crest width of 4' will require about 6.1 million ft ³ of work (173,000 m ³). This will cost about 293 million MMK (345,000 USD).			

Number	Township	Village Tract	Village
KP 58	Kyaukpyu	Wa Pyay	Wa Pyay
Sluices			
Wa Pyay's fields are located in Tidal Zone II.			
The western peninsula has a catchment area of about 830 acres, of which over 90% is low-lying. This means that 830 / 270 ~ 3 sluice openings are needed. There are currently three sluice structures with four openings: three of 3' wide, and one of 4'6" wide. This means that one more sluice opening is needed.			
The eastern peninsula has a catchment area of about 440 acres, of which over 90% is low-lying. This area needs two sluice openings (but a width of 4'6" per opening is enough).			
Drinking water			
The village has enough drinking water.			
Irrigation			
N/A			
Other			
N/A			

Number	Township	Village Tract	Village
KP 59	Kyaukpyu	Wa Pyay	Ma Au Pyein
Introduction			
This village has 132 households. 85 farmers cultivate 135 acres. There are 24 fishermen. 23 households depend on casual labour.			
Embankments			
The village has one paddy area, and one former paddy area that was converted into prawn ponds 8 years ago. The villagers now want to convert this land back into paddy fields, because prawns are not economically interesting anymore. Both areas together can be protected by two stretches of embankment, that are separated by a hill. The embankment separating the two areas does not add to the protection of the paddy fields, and does not need to be repaired at this point.			
The total length of the embankment to be repaired is about 9,200 feet. Upgrading this to 2' above spring high tide level, and with a crest width of 4' will require about 927,000 ft ³ of work (26,200 m ³). This will cost about 44.5 million MMK (52,300 USD).			
Sluices			
The total catchment area protected by the embankment is about 1,400 acres, of which 40% (about 570 acres) is low-lying land. This area is located in Tidal Zone II, which means that 1,400 / 310 ~ 4.5 sluice openings are needed. There are currently three structures with each two openings of 3'6" wide, and one structure with two openings of 3' wide. This should be enough. Two sluice openings need to be fitted with flap gates, and one sluice structure needs repairs to the wing walls.			
Drinking water			
The village has some shortage of drinking water. It has one pond and five wells, but three wells are damaged and one well dries up in april. People go to Kyauk Set Taung village if there is not enough water. It would be good if the wells can be repaired. For the dry well, it might be good to either deepen it, or to construct an infiltration pond nearby.			
Irrigation			
Near the creeks, it might be possible to introduce treadle pumps for small-scale irrigation.			
Other			
N/A			

Number	Township	Village Tract	Village
KP 60	Kyaukpyu	Wa Pyay	War Taung
Introduction			
War Taung has 71 households. 50 farmers cultivate 74 acres of paddy. There are 5 fishermen, and 16 households depend on casual labour.			
Embankments			
26 acres of low-lying paddy fields of War Taung are protected by four embankments, with a combined length of about 4,100'. If the embankments of Ma Au Pyein are also upgraded, one of these embankments (with a length of 600') does not need to be upgraded. Upgrading the remaining 3,500' of embankments to 2' above spring high tide level, and with a crest width of 4', will require about 299,000 ft ³ of work (8,500 m ³). This will cost about 14.3 million MMK (16,900 USD).			

Number	Township	Village Tract	Village
KP 60	Kyaukpyu	Wa Pyay	War Taung
Sluices			
The two catchment areas enclosed by the embankments are about 40 acres (of which 70% is low-lying) and about 100 acres (of which 20% is low-lying). There are no permanent sluice structures. The small catchment area needs one sluice opening of the design for Tidal Zone III, and the large catchment (near the village) needs two sluice openings of the design for Tidal Zone III.			
Drinking water			
The village has some shortage of drinking water. It has one pond and a well, but both dry up towards the end of the dry season. If there is not enough water, people go to other villages, several miles away, to collect water. A location for another well has been identified by the villagers. It might also be good to deepen (and possibly enlarge) the existing pond.			
Irrigation			
N/A			
Other			
N/A			

Number	Township	Village Tract	Village
KP 61	Kyaukpyu	Wa Pyay	Let Wea Tet
Introduction			
This village has 27 households. 18 households grow paddy on 44 acres. The remaining households are landless labourers.			
Embankments			
N/A: the village does not have low-lying paddy fields			
Sluices			
N/A			
Drinking water			
The village has enough drinking water. The village has one pond and one spring. The spring is also used by two other villages (War Taung, KP 60 and Wa Pyay, KP 58) in the dry season. For that reason, it would be good if the spring can be upgraded and fitted with a storage tank.			
Irrigation			
N/A			
Other			
N/A			

6.4 SOUTH-WESTERN KYAUKPYU

Nine villages were selected in the south-west of Kyaukpyu, near the border with Ramree Township. The landscape here consists of a fairly wide plain surrounded by hills. Most of the targeted villages have few paddy fields in the plain.

6.4.1 CHIN MIN PYIN (KP 37)

Number	Township	Village Tract	Village
KP 37	Kyaukpyu	Sa Ne Min Pyin	Chin Min Pyin
Introduction			
This village has 160 households. 30 farmers grow 90 acres of paddy. The other 130 households depend on casual labour.			
Embankments			
N/A: the village does not have low-lying fields			
Sluices			
N/A			
Drinking water			
The village faces a severe shortage of water in the dry season. If this happens, people take water from other villages. The village has one pond and three wells, but one well is for the monastery, and one well and the pond dry up in April. This pond is deep, so it seems that seepage might be a problem. If that is the case, lining will be a good idea. If land is available, it is also good to add another pond – or an infiltration reservoir to recharge the aquifer that the wells take their water from.			

Number	Township	Village Tract	Village
KP 37	Kyaukpyu	Sa Ne Min Pyin	Chin Min Pyin
Irrigation N/A			
Other N/A			

6.4.2 KYAUK TAUNG PYEIN (KP 33), CHAUNG NET (KP 34), AH WA PYIN (NORTH) (KP 35), TAW LEL (KP 36)

Number	Township	Village Tract	Village
KP 33	Kyaukpyu	Kyauk Taung Pyein	Kyauk Taung Pyein
Introduction The village has 104 households. 81 households cultivate 156 acres of paddy. 94 households have 130 acres of nipa palms. There are ten landless households.			
Embankments Part of the paddy fields (about 20-30 acres) are low-lying, and affected by salt water. These fields are protected by a short embankment of 730' long. Upgrading this embankment to a height of 2' above spring high tide, and a crest width of 6' (because this embankment also serves as a road to the neighbouring village of Taw Lel) will require about about 50,000 ft ³ of work (1,400 m ³). This will cost about 2.4 million MMK (2,800 USD).			
Sluices The catchment area of the embankment is about 50 acres, of which more than 80% is low-lying. This means that a single sluice opening of the design for Tidal Zone III is enough. There is currently no sluice in the embankment.			
Drinking water The village does not have enough water. It has two ponds and four wells. One of the wells is not used, and one of the ponds is full of algae, and needs rehabilitation. People now go to other villages by boat when they need more water. These villages are two miles away. It would be good if the ponds can be enlarged and, if possible, deepened.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 34	Kyaukpyu	Kyauk Taung Pyein	Chaung Net
Introduction The village has 130 households. 106 farmers grow 215 acres of paddy. 15 acres of this land is also used for growing groundnuts as winter crops. 60 of the farmer households have 150 acres of nipa palms. There are 24 households dependent on casual labour.			
Embankments N/A: this village does not have low-lying fields			
Sluices N/A			
Drinking water The village has five ponds, all of which dry up towards the end of April. There are also three wells. There is a shortage of drinking water at the end of the dry season. When this happens, people go to nearby villages. If seepage is a problem, the ponds need to be lined. Otherwise, it might be good to enlarge and deepen the existing ponds.			

Number	Township	Village Tract	Village
KP 34	Kyaukpyu	Kyauk Taung Pyein	Chaung Net
Irrigation			
<p>North-east of the village, there is a valley that is excellent for constructing a small irrigation reservoir. One option is to construct it pretty much on the boundary of the village. This dam will need to be about 10' high and 600 feet long. This option will have a bigger reservoir area, but it will also cover about 3 acres of paddy fields.</p> <p>The other option is about 200 metres further upstream. A dam here can be much shorter, but needs to be taller to have the same storage volume. Both options will cost about 20-30,000 USD, and will make irrigation of about 15-20 acres of winter crops possible. This dam will also provide additional drinking water, so renovation of the ponds may not be needed.</p>			
Other			
N/A			

Number	Township	Village Tract	Village
KP 35	Kyaukpyu	Ku Lar Kyan	Ah Wa Pyin (North)
Introduction			
<p>This village has 70 households. 35 households grow 120 acres of paddy. 30 households, some overlapping with the paddy farmers, grow 90 acres of nipa palms. 29 households depend on casual labour. There is one salt pan.</p>			
Embankments			
<p>The village has one 150' long embankment across a creek that protects the only pond of the village and about 7 acres of low-lying land against saltwater intrusion. This embankment was recently constructed, but needs to be upgraded for it to stay in its place. Upgrading this embankment will require about 11,000 ft³ of work (310 m³). This will cost about 525,000 MMK (620 USD).</p>			
Sluices			
<p>The catchment area of the embankment is so small that a single concrete pipe of 1'6" or 2' diameter will be enough to provide adequate drainage.</p>			
Drinking water			
<p>The village has one drinking water pond and three wells that are used for domestic purposes only. This pond is not enough in the dry season, and people then go to nearby villages to collect water. It might be good to enlarge (and possibly deepen) the existing pond.</p>			
Irrigation			
N/A			
Other			
N/A			

Number	Township	Village Tract	Village
KP 36	Kyaukpyu	Ku Lar Kyan	Taw Lel
Introduction			
<p>Taw Lel has 44 households. 25 farmers grow 25 acres of paddy. Farmers also grow winter crops (including peas). 15 households grow 15 acres of nipa palms. There are 19 households dependent on casual labour.</p>			
Embankments			
N/A: the village does not have low-lying paddy fields			
Sluices			
N/A			
Drinking water			
<p>The village has four ponds and a well. There is also a spring near the village that is used when there is not enough water in the ponds and well. This spring is also used by other villages.</p> <p>One of the ponds needs renovation.</p>			
Irrigation			
N/A			
Other			
N/A			

6.4.3 KON BAUNG (KP 32), LAUNG CHWAIN (KP 30), KIN YWAR GYI (KP 29), KIN MYAUK (KP 31)

Number	Township	Village Tract	Village
KP 32	Kyaukpyu	Ka Lant Te	Kon Baung
Introduction This village has 105 households. 77 households cultivate 157 acres of paddy and 25 acres of winter crops. 24 households grow nipa palms on 55 acres. There are 22 households dependent on casual labour, and no fishermen. Some fields were taken over by the Navy, and 200 acres were taken for a plantation.			
Embankments N/A. The village does not have low-lying fields. Some farmers cultivate fields protected by an embankment between Ka Lant Te (not on the Tat Lan list) and Laung Chwain (KP 30). See MY 30.			
Sluices N/A			
Drinking water The village has enough water, all from open wells with masonry lining. The school does not have a well, and people requested for a well there.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 30	Kyaukpyu	Kin Myauk	Laung Chwain
Introduction This village has 79 households. 37 households cultivate 128 acres of paddy. 24 households grow 50 acres of nipa palms. There are 7 fishermen, and 35 households dependent on casual labour.			
Embankments There is one embankment between Laung Chwain and Ka Lant Te. This embankment is jointly maintained by the embankment management committees of the two villages involved. It is 10,300 feet long, and needs to be raised by 2'6" to an average height of 5'6". Because the soil is rather sandy, the sideslopes must be 1:2, and the crest width must be 7'. Upgrading this embankment will require about 853,000 ft ³ of work (24,200 m ³). This will cost about 41 million MMK (48,200 USD).			
Sluices The embankment has a catchment of almost 1,700 acres, of which about 30% is low-lying. Being located in Tidal Zone II, this means that a total of 1,700 / 340 ~ 5 sluice openings are needed. There are currently two masonry sluice structures, each with three openings of 5' wide. This is enough. Five of the openings are fitted with flap gates, and one has no gate. Two flap gates are in good condition, and four new gates need to be fitted. Also, the foundation must be improved or the energy dissipation basins must be improved, because undermining is beginning to take place.			
Drinking water The village has 30 wells, and has enough drinking water.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 29	Kyaukpyu	Kin Myauk	Kin Ywar Gyi (Aung Zay Ya)
Introduction Aung Zay Ya, which is a merged village, has 120 households. 100 farmers cultivate 250 acres of paddy. The other 20 households are landless and depend on casual labour.			
Embankments N/A: this village does not have low-lying paddy fields			
Sluices N/A			

Number	Township	Village Tract	Village
KP 29	Kyaukpyu	Kin Myauk	Kin Ywar Gyi (Aung Zay Ya)
Drinking water			
The village has 45 open wells, but there is not enough water at the end of the dry season because the yield in the wells drops. Because the soil is sandy, there is no point in constructing a pond. The best option is probably the construction of one or more infiltration ponds, to supplement the aquifer. These ponds should be partially lined, to stretch the recharge into the end of the dry season.			
Irrigation			
N/A			
Other			
N/A			

Number	Township	Village Tract	Village
KP 31	Kyaukpyu	Kin Myauk	Kin Myauk
Introduction			
This village has 74 households. 59 farmers grow 236 acres of paddy and 10 acres of winter crops. There is one fisherman. The remaining 14 households depend on casual labour.			
Embankments			
N/A: this village does not have low-lying paddy fields			
Sluices			
N/A			
Drinking water			
The village has enough water throughout the year. It has 18 masonry-lined wells, of which four always have water.			
Irrigation			
N/A			
Other			
N/A			

6.5 ISLANDS IN NORTH-CENTRAL KYAUKPYU

North of Kyaukpyu town, four targeted villages are located on three small islands in Thea Tan VT. These islands are hilly, and have small paddy areas along the shores.

6.5.1 THEA TAN (KP 10), KON BAUNG (KP 11), LET NYOT NGON (KP 12), TAN KHA YOE (KP 13)

Number	Township	Village Tract	Village
KP 10	Kyaukpyu	Thea Tan	Thea Tan
Introduction			
This village has 76 households. 50 households cultivate about 105 acres of paddy and 2 acres of nipa palm. There are 30 fishermen (some of whom also grow paddy), and 20 households that depend on casual labour. A Chinese company has bought many fields in the village, and the remaining farmers consider selling their land as well.			
Embankments			
The paddy fields of Thea Tan are protected by a single embankment of about 1,700' long. Upgrading this embankment to 2' above spring high tide and a crest width of 5' (because the soil is rather sandy) will require about 149,000 ft ³ of work (4,200 m ³). This will cost about 7.1 million MMK (8,400 USD).			
Sluices			
The embankment has a catchment area about 120 acres, of which about 50% is low-lying. This means that a single sluice of the design for Tidal Zone III should be enough to ensure adequate drainage.			
Drinking water			
The village has one pond for drinking water, one well for domestic use, and one monastery well. Both wells have slightly salty water. There is not enough water at the moment. If the pond can be enlarged, there should be enough water.			
Irrigation			
N/A			

Number	Township	Village Tract	Village
KP 10	Kyaukpyu	Thea Tan	Thea Tan
Other N/A			

Number	Township	Village Tract	Village
KP 11	Kyaukpyu	Thea Tan	Kon Baung
Introduction This village has 91 households. 34 farmers cultivate about 70 acres of paddy. There are 40 fishermen, and 17 households that depend on casual labour.			
Embankments See KP 10. Part of the fields of Kon Baung are protected by the embankment of Thea Tan. East of the village, there are more paddy fields that are not affected by the sea.			
Sluices See KP 10			
Drinking water The village has some shortage of water at the end of the dry season. When that happens, people go to Tan Kha Yoe village to get water. There are two wells (one in the monastery, both a tasting a little salty) and one pond. This pond should be enlarged. Deepening is not possible because of the risk of saltwater intrusion.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 12	Kyaukpyu	Thea Tan	Let Nyot Ngon
Introduction This village has 35 households. 32 households depend on fishing. 3 households cultivate 10 acres of paddy. There is also shifting cultivation on the hillside east of the village.			
Embankments Apart from the fields that are cultivated, another 20 acres of paddy were cultivated before Giri. These fields are protected by an embankment of about 2,000' long. Upgrading it to a level 2' above spring high tide (average height 5'), and a crest width of 4' will require about 129,000 ft ³ of work (3,700 m ³). This will cost about 6.2 million MMK (7,300 USD).			
Sluices The embankment has a catchment area of about 100 acres, of which 20% is low-lying. It has no sluices at the moment. Two sluice openings of the design for Tidal Zone III are needed.			
Drinking water This village does not have enough water. When there is a shortage, the people collect water from Thea Tan (KP 10). It has only two wells, of which one is quite small. It would be good if this well could be enlarged. An infiltration pond on the eastern edge of the village might improve the quality of the water in the wells.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 13	Kyaukpyu	Thea Tan	Tan Kha Yoe
Introduction This village has 63 households. 20 households cultivate 45 acres of paddy; the other 43 households depend on fishing. There is also some shifting cultivation in the hills east of the village.			
Embankments N/A: this village does not have low-lying paddy fields			
Sluices N/A			
Drinking water This village has one spring that gives enough water. Water is taken to a collection tank in the village by a pipeline.			

Number	Township	Village Tract	Village
KP 13	Kyaukpyu	Thea Tan	Tan Kha Yoe
Irrigation N/A			
Other N/A			

6.6 NORTH-EASTERN KYAUKPYU

In the north-east of Kyaukpyu, nine villages were selected for Tat Lan. All of these villages are close to the seashore, with paddy fields near the shore. Some of these villages have substantial paddy areas.

6.6.1 PYIN WUNG (KP 05)

Number	Township	Village Tract	Village
KP 05	Kyaukpyu	Te Chaung	Pyin Wun
Introduction This village has 34 households. 19 are farmers, cultivating 145 acres of paddy. The other 15 are fishermen.			
Embankments The fields of Pyin Wun are located in three valleys. Each is protected by a short embankment. Two valleys have about 10 acres of paddy land each, while the northernmost valley has about 75 acres of paddy. The remaining paddy fields are not affected by the sea. The total length of the three embankments is about 3,900'. Upgrading the northern and southern embankments to crest width of 4' and a level of 2' above spring high tide level, and the middle embankment to a level of 3' above spring high tide level (because this embankment also protects the village) will require about 495,000 ft ³ of work (14,000 m ³). This will cost about 23.8 million MMK (28,000 USD).			
Sluices Each embankment will need its own sluices. This area is located in Tidal Zone I. The northernmost embankment has a catchment area of about 130 acres, of which about 60% is low-lying. It has one masonry sluice with a single, 4' wide opening and a depth of 4'. One additional sluice of the design for Tidal Zone III is needed. The middle embankment has a catchment area of about 60-80 acres, of which 12-15% is low-lying. A single sluice of the design for Tidal Zone II is needed (this sluice can be 3' wide). The southern embankment has a catchment area of about 40 acres, of which 25% is low-lying. A single sluice of the design for Tidal Zone III is needed here.			
Drinking water The village has only one pond. This pond does not carry enough water. When there is a shortage, people go to neighbouring villages to collect water. Seepage seems to be a problem, because the pond has more than enough capacity to meet all the needs for the village. If this is the case, the pond needs to be lined.			
Irrigation N/A			
Other N/A			

6.6.2 TE CHAUNG (KP 02), GONE TAUNG (KP 04), OHN TAW (KP 01)

Number	Township	Village Tract	Village
KP 02	Kyaukpyu	Te Chaung	Te Chaung
Introduction The village has 82 households. 53 are farmers, cultivating 379 acres of paddy. There are 13 fishermen, and 16 households depend on casual labour.			

Number	Township	Village Tract	Village
KP 02	Kyaukpyu	Te Chaung	Te Chaung
<p>Embankments The low-lying fields of Te Chaung are located in four valleys, each protected by an embankment. If all four embankments are upgraded, a fifth embankment between two valleys does not need to be upgraded. The combined length of the four embankments is about 7,700'. Upgrading them to 2' above spring high tide (and with a crest width of 5' for the northernmost embankment, and 4' for the other three embankments) will require about 1.1 million ft³ of work (30,000 m³). This will cost about 50.9 million MMK (59,900 USD).</p>			
<p>Sluices This area is located in Tidal Zone I. The northernmost embankment has a catchment area of about 180 acres, of which 20% is low-lying. This embankment needs a single sluice opening of the design for Tidal Zone II. The second embankment has a catchment area of about 150 acres, of which 25% is low-lying. This embankment has a good sluice structure with two openings of 3'6" wide and 4'6" deep. One more sluice opening of the design for Tidal Zone III is needed. The third embankment has a catchment area of about 250 acres, of which 30% is low-lying. This embankment has a good sluice structure with two openings of 5' wide and 5' deep. One more sluice opening of the design for Tidal Zone III is needed. The southernmost embankment has a catchment area of about 80 acres, of which 75% is low-lying. One sluice opening of the design for Tidal Zone III is needed.</p>			
<p>Drinking water The village depends mainly on a single pond for its water requirements. When this pond does not have enough water, people go to two springs close to the village. These springs have enough water, but storage is a problem. It would be good to construct storage tanks near these springs.</p>			
<p>Irrigation N/A</p>			
<p>Other N/A</p>			

Number	Township	Village Tract	Village
KP 04	Kyaukpyu	Te Chaung	Gone Taung
<p>Introduction This village has 155 households. 89 farmers cultivate 329 acres of paddy. There are also 27 fishermen, and 39 households that depend on casual labour. Gone Taung and Ohn Taw have been merged into one village (Gone Taung).</p>			
<p>Embankments The paddy fields of Gone Taung (including some prawn ponds that farmers want to reconvert into paddy fields) are protected by five embankments with a total length at the seafront of about 19,800'. These embankments must be upgraded to 2' above spring high tide, with a crest width of 4' for the three northwestern embankments, 6' for the fourth embankment, and 5' for the easternmost embankment. Because large stretches of the three eastern embankments will need to be between 8' and 8'6", these embankments need sideslopes of 1:2. In total, this will require about 2.9 million ft³ of work (83,500 m³). This will cost about 141.6 million MMK (167,000 USD).</p>			
<p>Sluices The fields of Gone Taung are on the boundary between Tidal Zone I and Tidal Zone II. From west to east, the first and third embankments share a catchment area of about 180 acres, of which about 60% is low-lying. This polder needs one sluice opening of the standard design for Tidal Zone II. The second embankment has a catchment area of about 10 acres, of which 70% is low-lying. This embankment needs a concrete pipe (2' diameter should be enough). The fourth and fifth embankments share a catchment area of about 3,800 acres, of which about 25% is low-lying. This area needs 3,800 / 470 ~ 8 sluice openings of a design between the standard designs for Tidal Zone I and Tidal Zone II. There are five sluices already, with six openings of 5' wide and 4-5' deep, two openings of 4'8" wide and 6' deep, and three openings of 4' side and 5' deep. One structure with two 5' wide openings was not constructed deep enough, and hardly any water flows out through it. Four additional sluice openings need to be added. Part of the fifth embankment also encloses a separate catchment area of about 40 acres, of which 75% is low-lying. This area has a small sluice (2' wide and 2'6" deep). Another sluice of the same design must be added.</p>			

Number	Township	Village Tract	Village
KP 04	Kyaukpyu	Te Chaung	Gone Taung
Drinking water The village has five ponds and one well. All the ponds dry up between April and May. When this happens, people go to a neighbouring village to get water. If seepage is a problem, it would be good to line one or more ponds. Villagers also suggested a location for a well on top of a spring. This well will have water throughout the year.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 01	Kyaukpyu	Te Chaung	Ohn Taw
Introduction This village has been merged with Gone Taung, and is now no longer considered a separate village.			
Embankments See KP 04			
Sluices See KP 04			
Drinking water See KP 04			
Irrigation See KP 04			
Other See KP 04			

6.6.3 KAT TU CHAING (KP 03)

Number	Township	Village Tract	Village
KP 03	Kyaukpyu	Te Chaung	Kat Tu Chaing
Introduction This village has 220 households. 175 farmers cultivate 625 acres of paddy. There are 30 fishermen, and 15 households depend on casual labour.			
Embankments In order to protect the paddy fields against the sea, a ring embankment must be constructed around the island on which Kat Tu Chaing is located. Some areas are hilly, and there no embankment will be necessary. Besides, a separate embankment is needed around a paddy area a little southeast of the village. Villagers also asked for a number of embankments between different paddy areas. These do not need to be included in Tat Lan as they have no direct function in protecting the fields against the sea. The total length of embankment that needs to be renovated is about 4.5 million ft ³ of work (127,000 m ³). This will cost about 216 million MMK (254,000 USD).			
Sluices The ring embankment around the village has five sluice structures with eleven openings of different sizes. This embankment has a catchment area of about 2,150 acres, of which about 80% is low-lying. Being located on the border of Tidal Zones I and II, this area needs 2,150 / 400 ~ 5.5 sluice openings. The precise levels of the existing sluices should be looked into, but it is likely that one or two sluice openings (of the design for Tidal Zone II) are needed. The embankment around the separate paddy area has a catchment area of about 120 acres, of which 60% is low-lying. This embankment does not have any sluices. A single sluice opening of the design for Tidal Zone III should be enough.			
Drinking water The village has six ponds and six wells, but there is not enough water at the end of the dry season. People then go to neighbouring villages to collect water. The villagers requested to enlarge a pond that is in the middle of the village. If seepage is a problem, lining of other ponds might be good. Four of the ponds are not very deep. It might be possible to deepen one or more these ponds.			
Irrigation N/A			

Number	Township	Village Tract	Village
KP 03	Kyaukpyu	Te Chaung	Kat Tu Chaing
Other N/A			

6.6.4 THEA CHAUNG (KP 06), U GAR HTON (KP 07), TAUNG NYO (KP 08)

Number	Township	Village Tract	Village
KP 06	Kyaukpyu	Thea Chaung	Thea Chaung
Introduction Thea Chaung has 330 households. 127 households cultivate 325 acres of paddy. There are also 48 fishermen, and 155 landless households that depend on casual labour.			
Embankments The paddy fields of Thea Chaung are protected by three embankments with a combined length of 10,700'. Upgrading these embankments (freeboard 2', crest width 4') will require about 868,000 ft ³ of work (24,600 m ³). This will cost about 41.7 million MMK (49,000 USD).			
Sluices The westernmost embankment has a catchment area of about 390 acres, of which 70% is low-lying. This embankment has one sluice with two openings of 4' wide and 5'6" deep. A single sluice of the design for Tidal Zone III must be added. The small embankment directly east of the village has a catchment area of about 30 acres, of which about 15% is low-lying. This embankment has a single sluice opening of 5' wide and 4' deep. This is enough. The easternmost embankment has a catchment area of about 75 acres, of which 60% is low-lying. This embankment has no sluice. One sluice opening of the design for tidal Zone III must be added.			
Drinking water The village has one pond that is mainly used for drinking and domestic water. There is a shortage of water at the end of the dry season. People then need to fetch fresh water by boat. There are many ponds near the village, but these are either damaged or used for livestock only. There is apparently fresh groundwater at about 400 to 500' depth, but for this a drilling rig is needed. Alternatively, it might be possible to renovate some of the abandoned ponds near the village.			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 07	Kyaukpyu	Thea Chaung	U Gar Hton
Introduction U Gar Hton has 86 households. 42 farmers cultivate 180 acres of paddy. The other 44 households depend on fishing.			
Embankments U Gar Hton and Taung Nyo (KP 08) are separated by a row of hills. The fields of U Gar Hton are to the west of these hills, and the fields of Taung Nyo to the east of these hills. In order to protect the fields of U Gar Hton, an outer embankment in three stretches (separated by small hills) needs to be upgraded. Short stretches of internal embankments can be done later, and do not need to be included under Tat Lan. The total length of this embankment is about 13,000'. It needs to be upgraded to 2' above spring high tide level (which means that the average height of the different stretches is 7'-8'. The crest width must be 4', except for the stretch directly west of the village, which must be given a crest width of 6'. In total, this will require about 1.5 million ft ³ of work (42,900 m ³). This will cost about 72.7 million MMK (85,500 USD).			
Sluices The embankments all share two catchment areas. To the west, there is a catchment area of about 240 acres, of which 70% is low-lying. There is one sluice opening of 5' wide and 5' deep. This area needs one more sluice opening of the design for Tidal Zone III. To the south, there is a catchment area of about 150 acres, of which 25% is low-lying. This area currently only has hollow wooden logs for sluices. One sluice opening of the design for Tidal Zone II must be added here (the sluice only needs to be 3' wide).			

Number	Township	Village Tract	Village
KP 07	Kyaukpyu	Thea Chaung	U Gar Hton
Drinking water This village has enough drinking water. People requested for storage tanks to be constructed near some of the springs (and possibly a pipeline to take the water to the village).			
Irrigation N/A			
Other N/A			

Number	Township	Village Tract	Village
KP 08	Kyaukpyu	Thea Chaung	Taung Nyo
Introduction The village has 31 households. 27 households depend on fishing. Four households cultivate 4 acres of paddy. This village is the poorest village of the village tract.			
Embankments Villagers are now developing an embankment to substantially expand the area under cultivation, but there is a conflict with the village of War Taung over the land that this embankment protects. If the land conflict is solved in favour of Taung Nyo, it will be possible to include this embankment under Tat Lan. This embankment has a length of about 14,500'. Upgrading this embankment to an average height of 7'6" and a crest width of 5' will require about 1.5 million ft ³ of work (42,400 m ³). This will cost about 71.9 million MMK (84,600 USD).			
Sluices The embankment currently has no good sluices. It has a catchment area of about 820 acres, of which 75% is low-lying. This area needs 820 / 270 ~ 3 sluice openings of the design for Tidal Zone II.			
Drinking water The village has one spring and one well. This does not provide enough water for the village. It would be good if the spring can be upgraded and fitted with a storage tank.			
Irrigation It might be possible to introduce treadle pumps along the creeks that will be blocked by the embankment.			
Other N/A			

6.6.5 PAUK NET CHAY (KP 09)

Number	Township	Village Tract	Village
KP 09	Kyaukpyu	Thea Chaung	Pauk Net Chay
Introduction This village consists of two hamlets, on the north and south of the island that they are on. There is a hill between the hamlets.			
Embankments Each hamlet has its own paddy fields, with its own embankment. The northern embankment is 3,200' long, and the southern embankment (which villagers only recently started to work on) is about 2,000' long. Renovating these embankments will require about 660,000 ft ³ of work (18,700 m ³). This will cost about 31.7 million MMK (37,300 USD).			
Sluices This area is in Tidal Zone II. The northern embankment has one sluice with two openings of 4' wide and 4' deep. This is not enough to let all the water out, and the structure is slowly being undermined. This embankment has a catchment area of about 200 acres, of which about 20-25% is low-lying. Two sluice openings of the design for Tidal Zone III need to be added. The southern embankment has a catchment area of about 100 acres, of which about 20% is low-lying. This embankment has no sluice yet. Two sluice openings of the design for Tidal Zone III must be constructed here.			

Number	Township	Village Tract	Village
KP 09	Kyaukpyu	Thea Chaung	Pauk Net Chay
Drinking water			
The northern hamlet does not have enough water. It has one pond for drinking purposes and one well. Towards the end of the dry season, people go to neighbouring villages to collect water. It might be possible to expand the existing pond and/or to construct an infiltration pond to increase recharge for the well. The southern hamlet has three ponds and two wells. This hamlet has enough water.			
Irrigation			
N/A			
Other			
N/A			

6.7 CENTRAL-EASTERN KYAUKPYU

The last five villages are located further inland, but along creeks with fairly large floodplains. These villages have larger paddy areas than most other selected villages in Kyaukpyu. Interestingly, the tidal fluctuation in this area is large (up to 14'); some of the villages should be classified in Tidal Zone I rather than Tidal Zone II.

6.7.1 LA HAR GYI (KP 42), YWAR THIT KAY (KP 43), NGA HPYIN THET (KP 44), AUNG THAR YAR (KP 45)

Number	Township	Village Tract	Village
KP 42	Kyaukpyu	La Har Gyi	La Har Gyi
Introduction			
This village has 30 households. 16 farmers cultivate 70 acres of paddy. There are 5 fishermen and 9 landless households.			
Embankments			
There are three embankments that need upgrading, but only one surrounds paddy fields owned by the village. One embankment protects a prawn pond. About 500 acres of paddy land protected by the third embankment have been sold to another village. Therefore, only one embankment needs to be considered for inclusion under Tat Lan. This embankment is about 5,000' long. Upgrading it to 2' above spring high tide, and with a crest width of 4' will require about 627,000 ft ³ of work (17,700 m ³). This will cost about 30.1 million MMK (35,400 USD).			
Sluices			
The embankment protecting the village's remaining paddy fields has a catchment area of about 50 acres, all of which is low-lying land. One sluice opening of the design for Tidal Zone III needs to be constructed.			
Drinking water			
The village has some shortage of drinking water during the dry season. When that happens, a spring is used, but this has a limited yield. The village has one pond and one well. The pond dries up in February. If the pond is enlarged (and especially if it is deepened!), the water availability can be increased. Alternatively, a storage tank can be constructed near the spring to capture the night flow.			
Irrigation			
N/A			
Other			
N/A			

Number	Township	Village Tract	Village
KP 43	Kyaukpyu	La Har Gyi	Ywar Thit Kay
Introduction			
This village has 125 households. 87 farmers cultivate 180 acres of paddy. The other 38 households are landless and depend on casual labour.			

Number	Township	Village Tract	Village
KP 43	Kyaukpyu	La Har Gyi	Ywar Thit Kay
Embankments			
<p>The fields of KP 43 and KP 44 are protected by connecting embankments. It is best to renovate them together (while leaving out the stretches that mark the boundary between village fields and do not directly protect fields from the sea). To the north, five stretches of embankment need to be upgraded, and to the south, two stretches of embankment need to be upgraded. The total length of these embankments is about 16,800'. Upgrading them to 2' above spring high tide level and with a crest width of 4' will require about 2.1 million ft³ of work (59,600 m³). This will cost about 101 million MMK (119,000 USD).</p>			
Sluices			
<p>The fields protected by the embankments fall into four separate catchment areas.</p> <p>The first and third embankment (counting from the northwest) share a catchment area of about 300 acres, of which 25% is low-lying. There is a sluice with three openings of 3'6" wide and 5' deep, which is equivalent to two sluice openings of the type for Tidal Zone III. Two sluice openings of the design for Tidal Zone III must be added.</p> <p>The second embankment has a catchment area of about 15 acres, of which 60% is low-lying. A concrete pipe (2' diameter) should be enough for this embankment.</p> <p>The easternmost southern embankment has a catchment area of about 40 acres, of which over 80% is low-lying. This embankment needs a single sluice opening of the design for Tidal Zone III (a width of 3' is enough)</p> <p>The remaining embankments share a catchment area of about 1,000 acres, of which 25% is low-lying. There are three sluice openings of 5' deep with a combined width of 16' (equivalent to three sluice openings of the type for Tidal Zone III). Two sluice openings of the design for Tidal Zone I must be added.</p>			
Drinking water			
<p>The village has two ponds and three wells. Both ponds dry up towards the end of April. When this happens, water is rationed. People asked for one of the ponds to be enlarged. This should make enough water available for the village.</p>			
Irrigation			
N/A			
Other			
N/A			

Number	Township	Village Tract	Village
KP 44	Kyaukpyu	La Har Gyi	Nga Hpyin Thet
Introduction			
<p>This village has 45 households. 28 farmers grow 40 acres of paddy. There are 7 fishermen, and 16 households depend on casual labour.</p>			
Embankments			
See KP 43.			
Sluices			
See KP 43.			
Drinking water			
<p>The village has two ponds, as well as a spring that was fitted with a pipeline and collection tank by Save the Children. The ponds dry up at the end of April, after which water use is rationed. It would be good to expand the existing ponds.</p>			
Irrigation			
N/A			
Other			
The village needs a small bridge across a creek to make access in the rainy season possible.			

Number	Township	Village Tract	Village
KP 45	Kyaukpyu	La Har Gyi	Aung Thar Yar
Introduction			
<p>This village has 69 households. 42 farmers cultivate 138 acres of paddy. There are 4 fishermen. 23 households depend on casual labour.</p>			

Number	Township	Village Tract	Village
KP 45	Kyaukpyu	La Har Gyi	Aung Thar Yar
Embankments			
<p>In order to protect the fields around Aung Thar Yar (and in order to expand the area that can be cultivated), a horseshoe embankment must be renovated. Internal embankments that separate clusters of fields do not need to be included under Tat Lan.</p> <p>The total length of the embankment to be renovated is about 19,000'. Upgrading this to 2' above spring high tide (average height 7'6"-8') and a crest width of 4' requires about 2.7 million ft³ of work (75,900 m³). This will cost about 129 million MMK (151,400 USD).</p>			
Sluices			
<p>The embankments of Aung Thar Yar have a catchment area of about 950 acres, of which 55% is low-lying. There is currently one sluice with two openings of 4'6" wide and 5' deep, and five PVC pipes of 8" diameter. This is equivalent to two sluice openings of the design for Tidal Zone III. Three more single-opening sluices of the design for Tidal Zone II need to be constructed, distributed over the various creeks.</p>			
Drinking water			
<p>This village faces a severe water problem. There are three ponds, of which one is in use for watering cattle. The other two ponds dry up in March, after which people go to other villages to collect water. If these two ponds are enlarged (and if possible deepened), there should be enough water.</p>			
Irrigation			
<p>It might be possible to introduce treadle pumps along the blocked creeks.</p>			
Other			
<p>A short embankment of 1,000' long protects the village and its drinking water sources against saltwater intrusion. This embankment must be upgraded to 3' above spring high tide level, and be given a crest width of 4'. That will require about 162,000 ft³ of work (4,600 m³). This will cost about 7.8 million MMK (9,100 USD).</p>			

6.7.2 AH NAUK HMYAR TEIN (KP 62)

Number	Township	Village Tract	Village
KP 62	Kyaukpyu	Ya Ta Na	Ah Nauk Hmyar Tein
Introduction			
<p>The village has 75 households. 60 farmers cultivate 425 acres of paddy. There is one fisherman. 14 households depend on casual labour. An area that was rented out as prawn pond will be converted back into paddy field if the embankment is renovated.</p>			
Embankments			
<p>The fields of Ah Nauk Hmyar Tein are located in three catchment areas. From west to east, they are protected by one, three and one embankment respectively. The Irrigation Department is renovating the westernmost embankment. The total length of embankments still to be renovated is about 12,700'. Upgrading these embankments to a level 2' above spring high tide level (and with a crest width of 4') will require 1.1 million ft³ of work (30,100 m³). This will cost about 51.0 million MMK (60,000 USD).</p>			
Sluices			
<p>This area is in Tidal Zone II. There are only wooden sluices at the moment.</p> <p>The westernmost catchment area (this embankment is being repaired by the Irrigation Department) is about 260 acres, of which 40% is low-lying. One sluice opening of the design for Tidal Zone II is needed.</p> <p>The middle catchment area is about 1,250 acres, of which about 60% is low-lying. This means that 1,250 / 280 ~ 4.5 sluice openings are needed. This can be done by building four sluice openings of the design for Tidal Zone II, but with a width of 6' per sluice opening.</p> <p>The eastern catchment area is about 180 acres, of which 25% is low-lying. A single sluice opening of the design for tidal Zone II is needed (a width of 4' is enough).</p>			
Drinking water			
<p>The village has three ponds, that dry up towards the end of the dry season. When this happens, water is rationed. If the ponds are enlarged (but especially if they are deepened, if that is possible), the village will have enough water.</p>			
Irrigation			
<p>Near the creeks, treadle pumps could be introduced.</p>			
Other			
<p>N/A</p>			

6.8 SUMMARY OF SUGGESTED INTERVENTIONS IN KYAUKPYU

The table below summarises the possible interventions in Kyaukpyu Township, which covers about 30% of all Tat Lan villages.

As can be seen, the total budget required for addressing all embankments and sluices in the 62 villages is about 3.0-3.4 million USD. This involves about 1.1 million m³ of earthworks, the construction of 85-86 sluice openings (6 of the type for Tidal Zone I, 27-28 of the type for Tidal Zone II, 47 of the type for Tidal Zone III and 5 concrete pipes), and the repair of 13 sluice structures (with in total about 25 sluice openings).

Note that there are 16 villages that do not require embankments or sluices, and one village that requires less than 5,000 USD of work on embankments and sluices.

For irrigation development, there are two villages where small dams can be constructed. This will cost 50-70,000 USD, and benefit 50-70 acres of winter crops. In several villages, there is potential for the introduction of treadle pumps. These can be either distributed, or demonstrated and linked to microcredit interventions.

In order to bring drinking water availability up to standard in all 62 villages on the list, the following interventions are needed:

- Enlarge or deepen 30-57 ponds
- Construct 2-3 ponds
- Provide lining for 6-35 ponds
- Upgrade 11-14 springs
- Construct 3 wells
- Renovate 4-7 wells
- Construct 1-8 infiltration ponds

This will cost anywhere between 100,000 and 300,000 USD (but probably around 150,000 USD). Detailed cost estimated still need to be made for several villages, and in several locations further analysis is needed to determine the best interventions. Note that in some villages, the number of ponds, wells, etc. that should be renovated or constructed depends on the available budget.

In terms of other infrastructure, two bridges, a village access road and a village protection bund are needed. This will cost about 40-80,000 USD.

Village	Embankments		Sluices		Irrigation		Drinking water		Other infrastructure	
	M ³	US \$	No.	US \$	Intervention	US \$	Intervention	US \$	Intervention	US \$
KP 01	See KP 04 (village no longer exists as a separate village)									
KP 02	30,000	59,900	One sluice opening (T.Z. II design), three sluice openings (T.Z. III design)	35,000-50,000	N/A	-	Upgrade 2 springs with storage tanks	PM	N/A	-
KP 03	127,000	254,000	One or two sluice openings (T.Z. II design), one sluice opening (T.Z. III design)	25,000-55,000	Treadle pumps	PM	Enlarge 1 pond and deepen 1-4 ponds, and/or provide lining for 1-6 ponds	PM	N/A	-
KP 04	83,500	167,000	Four sluice openings (halfway between T.Z. I and II design), one sluice opening (T.Z. II design), one small sluice (2' wide, 4' deep) One concrete pipe (2' diameter)	100,000-130,000	Treadle pumps	PM	Provide lining for 1-5 ponds. Construct 1 well on top of a spring	PM	N/A	-
KP 05	14,000	28,000	One sluice opening (T.Z. II design), two sluice openings (T.Z. III design)	30,000-40,000	N/A	-	Provide lining for 1 pond	PM	N/A	-
KP 06	24,600	49,000	Two sluice openings (T.Z. III design)	10,000-16,000	N/A	-	Renovate several abandoned ponds near the village	PM	N/A	-
KP 07	42,900	85,500	One sluice opening (T.Z. II design), one sluice opening (T.Z. III design)	25,000-33,000	N/A	-	Construct storage tanks near 1 or 2 springs (and possibly a pipeline to the village) – not a priority	PM	N/A	-
KP 08	42,400	84,600	Three sluice openings (T.Z. II design)	55,000-75,000	N/A	-	Construct storage tank for 1 spring.	PM	N/A	-
KP 09	18,700	37,300	Four sluice openings (T.Z. III design)	20,000-32,000	N/A	-	Enlarge 1 pond and/or construct 1 infiltration pond.	PM	N/A	-

Village	Embankments		Sluices		Irrigation		Drinking water		Other infrastructure	
	M ³	US \$	No.	US \$	Intervention	US \$	Intervention	US \$	Intervention	US \$
KP 10	4,200	8,400	One sluice opening (T.Z. III design)	5,000-8,000	N/A	-	Enlarge 1 pond	1-2,000	N/A	-
KP 11	See KP 10	See KP 10	See KP 10	See KP 10	N/A	-	Enlarge 1 pond	1-2,000	N/A	-
KP 12	3,700	7,300	Two sluice openings (T.Z. III design)	10,000-16,000	N/A	-	Enlarge 1 well. Possibly construct 1 infiltration pond	1-4,000	N/A	-
KP 13	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
KP 14	N/A	-	N/A	-	N/A	-	Enlarge 1 pond	1-2,000	N/A	-
KP 15	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
KP 16	94,000	187,600	Three sluice openings (T.Z. II design) plus three sluice openings (T.Z. III design)	70,000-90,000	N/A	-	Enlarge 2-4 ponds	2-8,000	N/A	-
KP 17	2,000	4,000	Renovate 1 sluice structure, construct 1 concrete pipe	5,000-8,000	Treadle pumps	PM	Enlarge 1 pond	1-2,000	N/A	-
KP 18	2,700	5,300	Renovate 2 sluice structures	3,000-5,000	Treadle pumps	PM	Deepen 1-5 ponds, or construct 1-2 wells	PM	Bridge to allow gas pipeline inspection road to cross creek near the village	PM
KP 19	700	1,400	Renovate 1 sluice	1,000-2,000	N/A	-	Pipeline from spring to village (not a priority)	PM	N/A	-
KP 20	N/A	-	N/A	-	N/A	-	Enlarge 1 pond	1-2,000	N/A	-
KP 21	12,800	25,500	Renovate 1 sluice structure	2,000-5,000	N/A	-	Enlarge 1 pond or provide lining to one or more ponds	PM	N/A	-
KP 22	See KP 21	See KP 21	See KP 21	See KP 21	N/A	-	Provide lining to one or more ponds	PM	N/A	-
KP 23	33,400	66,700	1 structure with 2 openings (T.Z. III design), 1 structure with 1 opening (T.Z. III design)	15,000-24,000	Treadle pumps	PM	Provide lining for 1-3 ponds	PM	N/A	-
KP 24	N/A	-	N/A	-	N/A	-	Enlarge (and deepen) 2 ponds	2-4,000	N/A	-

Village	Embankments		Sluices		Irrigation		Drinking water		Other infrastructure	
	M ³	US \$	No.	US \$	Intervention	US \$	Intervention	US \$	Intervention	US \$
KP 25	3,300	6,600	1 sluice (T.Z. III design, 3' wide) and one 2' diameter concrete pipe	8,000	N/A	-	Construct 1 pond	2-3,000	N/A	-
KP 26	6,400	12,800	1 sluice (T.Z. III design, 5'-6'high)	6,000	N/A	-	Protect 3 springs and construct storage reservoirs	PM	N/A	-
KP 27	17,000	34,000	Two sluice openings (T.Z. III design)	10,000-16,000	N/A	-	Construct 1 pond	2-3,000	N/A	-
KP 28	See KP 39	See KP 39	See KP 39	See KP 39	N/A	-	Enlarge 1 pond	1-2,000	N/A	-
KP 29	N/A	-	N/A	-	N/A	-	Construct 1-4 infiltration ponds	2-8,000	N/A	-
KP 30	24,200	48,200	Install 4 new flap gates	5,000-10,000	N/A	-	N/A	-	N/A	-
KP 31	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
KP 32	N/A	-	N/A	-	N/A	-	Construct 1 well in school compound	1-2,000	N/A	-
KP 33	1,400	2,800	One sluice opening (T.Z. III design)	5,000-8,000	N/A	-	Enlarge / deepen 2 ponds	2-4,000	N/A	-
KP 34	N/A	-	N/A	-	1 small dam	20-30,000	Provide lining for 1-5 ponds or deepen 1-5 ponds.	PM	N/A	-
KP 35	310	620	1 concrete pipe of 1'6" or 2' diameter	1,000-2,000	N/A	-	Enlarge / deepen 1 pond	1-2,000	N/A	-
KP 36	N/A	-	N/A	-	N/A	-	Renovate 1 pond	1-2,000	N/A	-
KP 37	N/A	-	N/A	-	N/A	-	Provide lining for 1 pond. Add 1 pond or infiltration pond.	PM	N/A	-
KP 38	4,200	8,300	2 new flap gates, 2 new sluice openings (T.Z. III design)	12,000-20,000	N/A	-	Provide lining for 1 or 2 ponds	PM	N/A	-
KP 39	1,150	2,300	3 sluice structures to be repaired	20-30,000	N/A	-	N/A	-	N/A	-
KP 40	See KP 39	See KP 39	See KP 39	See KP 39	N/A	-	N/A	-	N/A	-
KP 41	See KP 39	See KP 39	See KP 39	See KP 39	N/A	-	N/A	-	N/A	-

Village	Embankments		Sluices		Irrigation		Drinking water		Other infrastructure	
	M ³	US \$	No.	US \$	Intervention	US \$	Intervention	US \$	Intervention	US \$
KP 42	17,700	35,400	One sluice opening (T.Z. III design)	5,000-8,000	N/A		- Enlarge / deepen 1 pond or construct storage tank near spring	1-3,000	N/A	-
KP 43	59,600	119,000	Two sluice openings (T.Z. I design), three sluice openings (T.Z. III design), one concrete pipe (2' diameter)	50,000-75,000	N/A		- Enlarge 1 pond	1-2,000	N/A	-
KP 44	See KP 43	See KP 43	See KP 43	See KP 43	N/A		- Enlarge 2 ponds	2-4,000	1 small bridge	PM
KP 45	75,900	151,400	Three sluice openings (T.Z. II design)	60,000-75,000	Treadle pumps	PM	Enlarge / deepen 2 ponds	2-4,000	Village protection bund (1,000')	9,100
KP 46	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
KP 47	N/A	-	N/A	-	N/A	-	Deepen 1 or 2 ponds	1-4,000	N/A	-
KP 48	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
KP 49	19,600	39,000	Four sluice openings (T.Z. III design)	20,000-32,000	N/A	-	N/A	-	N/A	-
KP 50	930	1,900	Replace two flap gates	1,000	N/A	-	N/A	-	N/A	-
KP 51	32,600	65,000	Two sluice openings (T.Z. III design)	10,000-16,000	N/A	-	Pipeline from spring to village	PM	Possibly construction of an access road	PM
KP 52	2,300	4,500	One sluice opening (T.Z. III design)	5,000-8,000	Small dam	30,000-40,000	N/A	-	N/A	-
KP 53	26,600	53,100	Two sluice openings (T.Z. III design)	10,000-16,000	N/A	-	Pipeline from spring to village	PM	N/A	-
KP 54	3,900	7,800	Two sluice openings (T.Z. II design)	40,000-50,000	N/A	-	N/A	-	N/A	-
KP 55	4,900	9,700	1 structure with 2 openings (T.Z. II design)	35,000-40,000	N/A	-	Provide lining for 1 or 2 ponds	PM	N/A	-

Village	Embankments		Sluices		Irrigation		Drinking water		Other infrastructure	
	M ³	US \$	No.	US \$	Intervention	US \$	Intervention	US \$	Intervention	US \$
KP 56	N/A	-	N/A	-	N/A	-	Deepen and enlarge 2 ponds. Possibly provide lining for 1 or 2 ponds.	PM	N/A	-
KP 57	4,400	8,700	1 sluice (T.Z. III design)	5,000-8,000	N/A	-	Deepen one or more ponds, or line 2-5 ponds	PM	N/A	-
KP 58	173,000	345,000	Three sluice openings (T.Z. II design)	55,000-75,000	N/A	-	N/A	-	N/A	-
KP 59	26,200	52,300	Renovation of 1 structure	3,000-6,000	Treadle pumps for use near blocked creeks	PM	Repair 3 wells. Deepen 1 well or construct infiltration pond	PM	N/A	-
KP 60	8,500	16,900	Three sluice openings (T.Z. III design)	15,000-24,000	N/A	-	Construct 1 well. Deepen / enlarge 1 pond	3-6,000	N/A	-
KP 61	N/A	-	N/A	-	N/A	-	Upgrade 1 spring and fit with storage tank	PM	N/A	-
KP 62	30,100	60,000	Six sluice openings (T.Z. II design)	100,000-150,000	Introduce treadle pumps for use near creeks	PM	Enlarge / deepen 3 ponds	3-6,000	N/A	-
Total	1,080,790	2,156,820		892,000-1,273,000				50,000-70,000 + PM	120,000-170,000	PM

