

CYCLONE SHELTER ASSESSMENT

DRAFT-SUMMARY REPORT

2012



I. Background:

Myanmar is exposed to multiple hazards such as cyclone, storm surge, floods, tsunamis, earthquakes, landslides and fire. As per the data from 1998 to 2007, fires constituted about 71% of reported disaster events, followed by storms (11%), floods (10%), and others (8%) including earthquakes, tsunami and landslides (MAPDRR 2009-2015). Over the past four decades, six major cyclones hit Myanmar; 1968 (Sittwe cyclone), 1975 (Patheingyi cyclone), 1982 (Gwa cyclone), 1994 (Maundaw cyclone), 2006 (Mala cyclone) and 2008 (Nargis cyclone). The Sittwe cyclone led to a loss of 1037 lives, Patheingyi cyclone claimed 304 lives and Cyclone Nargis (2008) which claimed 138,373 lives (90% of death directly due to storm surge) was the worst natural disaster in the living memory of Myanmar.

II. Rationale for study:

Three years have since passed, and Cyclone Nargis recovery has been slow and painstaking, with various local NGOs, INGOs, UN and other agencies playing diverse roles in restoring the livelihoods and economy of the Delta. Post-Nargis field surveys undertaken by various NGOs, INGOs and UN agencies indicate that the majority of populations living in these areas are poor households, “landless”, relatively asset-poor, deriving their livelihood mainly as casual labor, and seasonal fishing, shrimp and salt farming in the region.

Given the exposure to future cyclone events, an important aspect of cyclone risk reduction and mitigating losses of life, in the Delta regions during the recovery was to protect the lives and livelihoods of people by construction of cyclone resistant housing/buildings and construction of cyclone shelters with complementary disaster risk reduction activities such as CBDRR, Early Warning Dissemination mechanisms and mitigation activities. Thus the process of integrating and incorporating disaster risk reduction in the implementation programs of various organizations has become an essential component in addressing recovery of the Delta region.

While there is little information on the availability of cyclone shelters prior to cyclone Nargis (refer Box 1 below), a total of 358 cyclone-resistant community buildings (includes completed, under construction and planned), in 8 townships in the region were listed according to the data collected by UN-Habitat through the Shelter Working Group (23rd February, 2010) with support from the DRR Working Group members. These shelters include: stand-alone cyclone shelters, school cum shelters, hospitals cum shelters, monasteries cum shelters, government shelters, etc. either through renovating and retrofitting existing structures but primarily through building new shelters in vulnerable areas. Over the past three years, the Government, together with the humanitarian and development aid community has sought to invest in disaster risk reduction and disaster preparedness measures and programs in support to communities, in order to reduce their vulnerability and increase their readiness in case of disasters.

A total of 358 cyclone-resistant community buildings (includes completed, under construction and planned), in 8 townships were listed according to data collected by UN-Habitat (23rd February, 2010). These include stand-alone cyclone shelters, school cum shelters, hospitals cum shelters, monasteries cum shelters, government shelter, etc.

Box 1: Pre Nargis Situation:

There is no readily available data on designated cyclone shelters before cyclone Nargis. According to the study team survey in 72 villages covering 8 townships, there were no pre designated shelters to take refuge at the time of cyclone. According to the study, majority of the people have taken shelter at home /neighbor's /friends / relative's house followed by monasteries, schools, and other structures such as church, health center and other places / structures which were deemed safe. People found Monastery, neighbor's / friends home and schools as an important structure for protection.

The purpose of this study was to document a technical assessment of a sample of these existing shelters on their functionality, accessibility, operation and management, community perspectives; identify gaps, needs and further the linkages with community-based disaster risk reduction (CDBRR) activities. The study also aims at a wider assessment: looking at broader recovery in terms of shelter and livelihood aspects with clear linkages and strategic direction for future cyclone shelter support activities.

III. Objectives of current study

Specific objectives are follows:

- GIS mapping with population density and number of existing cyclone shelters
- To categorize building types and find out location and accessibility to the buildings
- To evaluate the community's feeling of safety
- To assess community's feeling of ownership
- To find out utilization of these buildings during peace time
- To assess the quality of buildings and their life spans before retrofitting them if initial construction is not fit enough
- To assess effective management on operation and current practice of maintenance plan
- To identify gaps and opportunities for future cyclone shelter needs
- To use the findings from the survey as an effective planning tool for future cyclone shelter construction practices
- To set up maintenance strategy in order to meet cyclone shelter standard, that is yet to be formulized
- To integrate disaster-resilient shelters into township disaster management plans
- To provide guidelines for future action plans for disaster risk reduction at community level

IV. Methodology :

The core of the evaluation includes a survey and technical assessment of the existing shelters in relation with location, household size, ownership, safety, management options, identify gaps, needs, inputs for development of future cyclone shelter strategy and its standardization in Myanmar. For the purpose of the study, 20% (72) of the total number of shelters (356 shelters in 8 townships) was considered. However during the study process, the team identified 9 more shelters from the original 72 as one village had more than one type of designated cyclone shelter thus adding to a total of total of 81 shelters. Shelter selection was based on two important criteria:

- Geographically representative sample / shelter
- Samples from each shelter type selected for disaggregated analysis.

In addition other variables such as proximity to sea / river or creeks, type, etc were considered.

Based on the above criteria, 81 cyclone resistant community buildings located in 72 villages were identified in 8 townships which includes stand-alone cyclone shelters, school cum shelters, hospitals cum shelters, monasteries cum shelters, government shelter, etc. Box below shows the location and type of cyclone shelters in 8 townships of the Delta region. Figure 1, blue dots indicate all the villages in the 8 townships and yellow dots indicate all 356 existing cyclone shelters and red circles indicate sampled cyclone shelters for the purpose of the study

Township	Church cum Cyclone shelter	Community Building Rehabilitation	Cyclone Shelter	Government Proposed Cyclone shelter	Monastery cum Cyclone shelter	Multipurpose Building	School cum Cyclone Shelter	Strom and Flood Resistant building	Total by location
Ngapudaw	-	-	-	-	-	-	5	-	5
Labutta	2	2	9 (2)	11(3)	8 (2)	-	71 (14)	-	103 (21)
Mawlamyinegyun	-	-	2	-	-	-	49 (10)	-	51 (10)
Pyapon	-	-	-	5 (1)	-	-	27 (4)	5(3)	37(8)
Bogale	-	8 (2)	4 (1)	2	-	1	71 (14)	18 (4)	104(21)
Kyaiklat	-	-	-	-	-	-	11 (4)	-	11 (4)
Dedaye	-	1	4 (1)	1	-	-	13 (3)	-	19 (4)
Twantay	-	-	-	-	-	-	4	-	4
Kawhmu	-	-	-	-	-	-	7	-	7
Kungyangon	-	5 (2)	-	1	-	-	9 (2)	-	15(4)
Total by type	2	16 (4)	19 (4)	20 (4)	8 (2)	1	267 (51)	23 (7)	356 (72)

Note: “ ()”no of shelters identified by location and type for proposed study in parenthesis

Table 1. Total Number of Cyclone Shelters and identified for survey by township and type

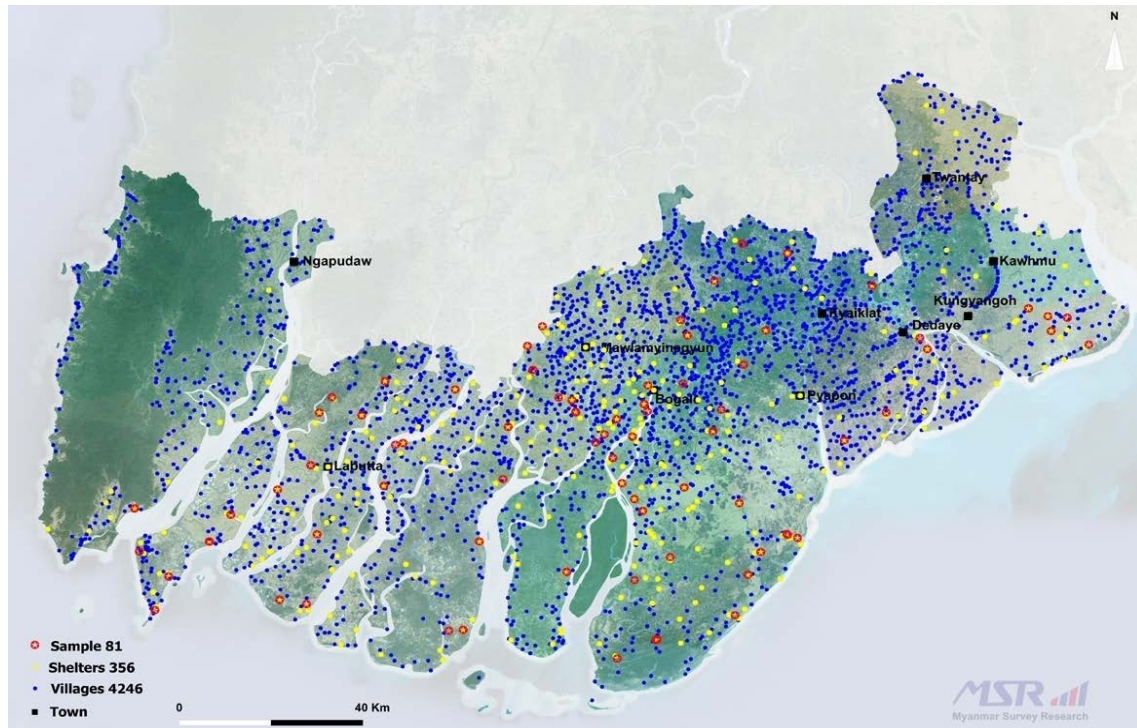


Figure 1: Location of villages, cyclone shelters and identified sample cyclone shelters.

Desktop Research:

Desktop research was carried out to get a good idea on the different aspects of the study. Current documents such as the Post-Nargis Shelter Sector Assessment Report-2010, MAPDRR (2009-2015), Multi-Hazard Risk Assessment in Nargis-affected areas (Ayeyarwaddy, Bago, Yangon), Lessons Learnt and way forward for resilient shelter interventions, among others, were studied. Documents and reports on the experience of neighboring countries such as Bangladesh and India were extensively studied. Internet research on articles and documents relevant to the study was carried out.

Tools:

Five sets of comprehensive questionnaire for the study purpose was developed with experts from Myanmar Survey Research (MSR) and UN-Habitat which included

1. Observation check lists
2. Household
3. One child aged 8-14 years / household,
4. Key Informant Interview (KII), and
5. Focus Group Discussions (FGD).

Pre-testing

Field teams were deployed for the assessment covering 8 townships, spanning over 18 days, between 15th October and 12th November 2011 (including travel time). Field staff received intensive training on selection of respondents, all aspects of the questionnaire, FGD topics, social skills and

research ethics. Pre-testing of the research tools was done in Kungyangon Township in Yangon Division. Debriefing and modifications to the questionnaire was done, before finalizing all research tools. In addition, MSR field teams were equipped with GPS monitoring systems to record the exact location of the cyclone shelters.

Box 2: Study Sample

- 81 shelters in 72 locations (as some villages had more than one designated cyclone shelter)
- 720 HH Interviewed and 1440 Interviews (10 House Hold and one child per household / Village)
- 78 Key Informant Interview
- 24 Focus Group Discussion

Data from completely filled-out and coded quantitative questionnaires were assembled and analyzed using CS Pro Version 4.0.004 (Census and Survey Processing System), SPSS Version 13.0 and qualitative research data using Atlas Vesion 4.0. Manifold System 8.0 software was used for GIS mapping.

V. Profile of cyclone shelters villages in the delta

Villages identified as part of the study had population varying from a minimum of 42 HH to a maximum of 2382 HH. Also the livelihood profile of the villages varied distinctly. Table 2 below provides the profile of the villages. Study found that there were no predestinated cyclone shelter at the time of cyclone Nargis and majority of the people have taken shelter at home /neighbor’s /friends / relative’s house followed by monastery, schools, and other structures such as church, health center and other places / structures which were deemed safe. Majority of the villages experienced storm surges over 4-5 feet and the death toll varied between distinctly.

Description	Minimum	Maximum	Total
Number of Households (HH) / Village	42	2,382	-
Population / Village	81 (M) / 87 (F) 168 (T)	4,386 (M)/ 4,776 (F) 9162 (T)	54,538 (M) 55,320 (F) 109,858 (T)
Livelihood			
Paddy cultivation	3	303	5,864
Gardening	-	150	979
Fishing	-	477	2733
Aquaculture	-	105	241
Handicraft	-	102	331
Trading	-	277	1631
Casual Labour	13	862	13,650
Others	-	182	221

Table 2: Profile of villages identified where cyclone shelters are located.

VI. Study Findings as per objectives

Methodological triangulation involving direct observation, key informant interview, interviews, and questionnaires was done to obtain an all-inclusive and balanced picture of the current situation of cyclone shelters in the target areas. Discussions and interviews around the specific objectives of the survey were conducted, and a summary of the results is presented below.

a. To identify GIS mapping with population density and number of existing cyclone shelters

UN-Habitat study on cyclone shelters in Delta region categorized 356 cyclone shelters into stand-alone cyclone shelters, school cum shelters, hospitals cum shelters, monasteries cum shelters, government shelter, etc (February, 2010). Table_ provides the summary of type of shelters in eight townships in the Delta region.

The current study identified a total of 81 cyclone shelters in 78 locations for the assessment (November, 2011). According to the assessment findings of the 81 cyclone shelters, 58 (74.4%) of cyclone shelters were constructed in 2009 and 19 (24.4%) in 2010 and 1 in 2011 and rest were under various stages of construction. In addition to the government executed cyclone shelters, most cyclone shelters were funded by Red Cross, INGO's, and UN agencies built by the contractors.

Population varies across villages from 168 people to 9162. And total population of villages identified for the study is 109,858 which average to 1525/ village.

b. To categorize building types and find out location and accessibility to the buildings

Building Type:

As indicated in the previous section, majority of shelter identified under UN-Habitat study in the region were school-cum cyclone shelter 257 (356) and the study took a balanced approach on the type and distribution of the shelter for the assessment

Figure 2 provides the type of cyclone shelters surveyed which includes 68 (85.95%) School cum shelter, 8 (9.88%), Cyclone shelter-stand alone, 3 (3.70%) Monastery cum shelter and 1 (1.23%) Health cum shelter and multipurpose community building respectively.

Among the 81 cyclone shelters, around 61 (75.3%) of the shelters were 1 storey structures, and 17 (21.0%) two storey and 3 (3.7%) are 3 storey structures which are built by the government.

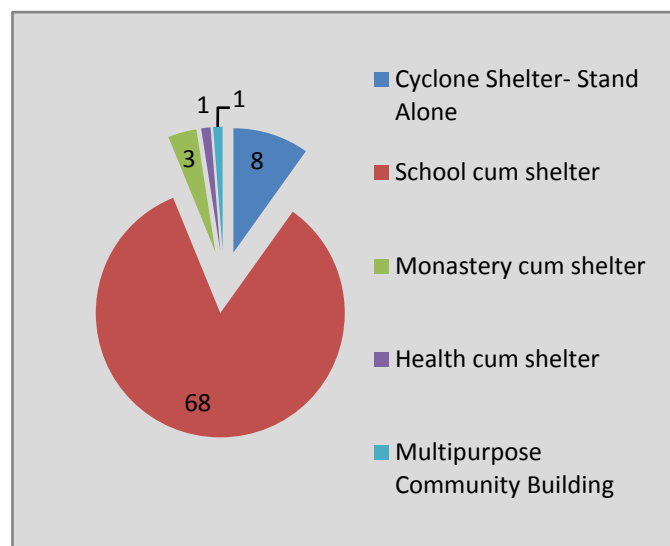


Figure 2: Type of Cyclone Shelters classified in 8 townships as part of the study

Shelter type: School cum cyclone shelter type



Township: Laputta
Area: 18496 sq ft

Village: Pyin Kh)a Yaing
Year of Construction: 2009

Shelter type: Monastery sum cyclone shelter type



Township: Laputta
Area: 1600 sq ft

Village: Kyun Chaung
Year of Construction: 2009

Shelter type: School cum cyclone shelter type



Township: Mawlyamyinegyun
Area: 2400 sq ft

Village: Sein Pan
Year of Construction: 2010

Shelter type: School cum cyclone shelter type



Township: Pyapon
Area: 5376 sq ft

Village: Tei Pin Seik
Year of Construction: 2009

Shelter type: School cum cyclone shelter



Township: Pyapon
Area: 1800 sq ft

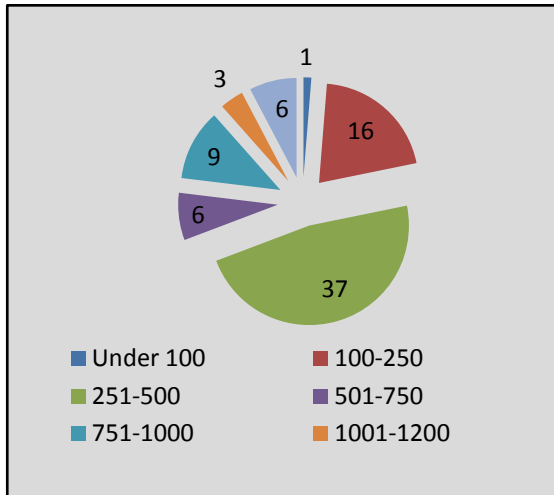
Village: Chaung Wa
Year of Construction: 2009

Shelter type: School cum cyclone shelter



Township: Pyapon
Area: 2304 sq ft

Village: Bo Su Chaung
Year of Construction: 2010



Around 53 (65.4%) of the shelters are with a floor area of 1800-3000sq ft, 24 (29.6%) are 3001 sq ft and above and 4 (4.9%) under 1800 sq ft. Figure 3 below provides the capacity in terms of occupancy level of cyclone shelters during time of emergency. Around 37 (45%) of the shelter has the capacity to accommodate between 251-500 people and there are very few shelters with large capacity in relation to the population of the village.

According to the Key Informant Interview, around 83.3% of cyclone shelter has been planned to cover 1 village and 16.7% of the shelters cover over 2 or more villages.

more villages.

Figure 3: Cyclone Shelter capacity – classified based on occupancy

While the size of the structures in terms of area and occupancy varies considerably (refer to previous section) around 47 (58.0%) of the shelters are of room type and while the rest 34 (42.0%) are of hall type. Number of rooms vary from 1 to 20 rooms and only 18 (22.2%) of the shelters have separate space for women and the rest 63 (77.8%) of the shelters does not have space provision for women. Below table shows number of rooms available in the cyclone shelter.

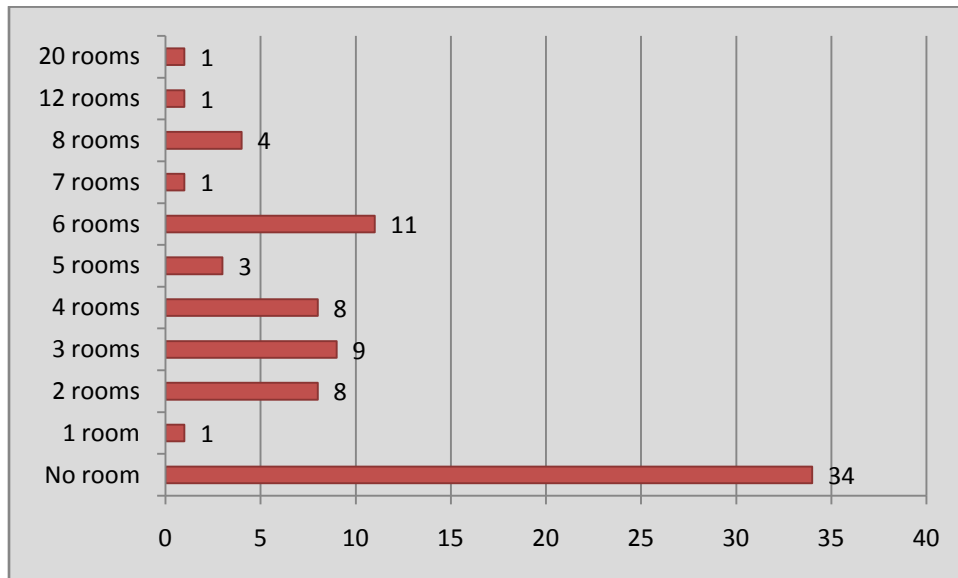


Figure 4 : Cyclone shelter classified based on number of rooms.

Study found that capacity of the shelters was a big concern. About three quarters of the school cum shelters were single storied structures, either a single room or comprising 1-6 rooms. It was apparent from the discussions and interviews that each shelter, on an average, ranged between 1800-3000 square feet, and could accommodate between 250 and 400 people. However, it was felt

that shelters would be overcrowded in the event of a natural disaster. In the wake of a storm surge or cyclone, HH's feel that each cyclone shelter would bring in people from an average of 7 nearby villages (minimum 2 and maximum of 10 villages). Potential overcrowding of the shelter was a concern. Space availability for the elderly, disabled and pregnant women would be compromised.

The knowledge and awareness of the households regarding the actual capacity of the shelter and the scenario of overcrowding is suggestive that few were actually involved in decision making.

Structural Elements:

Most structural elements, 71 (87.7%) Post / Column, 74 (91.4%) Floors were made of Reinforced Concrete while few made of Wood and Brick. Walls are predominantly made of Brick 48 (59.3%), followed by Reinforced Concrete 27 (33.3%) and by wood 5 (6.2%). Roofing for the super structures are predominantly sheets /tiles 62 (76.5%) and Reinforced Concrete 19 (23.5%).

Structural Element / Material	Reinforced Concrete	Wood	Brick	Others	Total
Post / Colum	71(87.7%)	5(6.2%)	4 (4.9%)	1 (1.2%)	81 (100%)
Wall	27 (33.3)	5 (6.2%)	48 (59.3%)	1 (1.2%)	81 (100%)
Floor	74 (91.4)	6 (7.4%)	-	1 (1.2%)	81 (100%)
Roof	19 (23.5%)	-	-	62 (76.5%)	81 (100%)

A striking observation was that only 19 (23.5%) of the shelters had reinforced concrete roofing and rest were made of GI Sheets/ tiles etc. According to the respondents, metal sheet roofing and / or tiled roofs were likely to be blown away in the event of gale-like situations and cyclones, where wind speed could exceed 200 km/hour.

Location:

Of the surveyed cyclone shelters, around 47 (58%) cyclone shelters were located in middle of the village, 22 (27%) on the fringe of the village, while the 12 shelters (15%) outside the village. Around 55 (67.9%) cyclone shelters were located in open space while 24 (29.6%) and 2 (2.5%) located inside and outside the embankment.

Schools cum cyclone shelters and monasteries cum shelters were mostly located in the center of the village, on high ground. The location of the shelter on high ground was more obvious with the school shelters than any other types of shelters.

Of the 720 households interviewed for the study, 610 (85%) of the respondents were aware of the existence of cyclone shelter in their village and more than three quarters of the HH interviewed mentioned the presence of a school cum cyclone shelter or monastery cum cyclone shelter in their community. As they had contributed their labor towards building the school or monastery cum shelters, that they attend regular school meetings there, "it is the only tallest building in the

village”, “only highest building in the village”, “only strongest building that can withstand high winds and cyclonic situations”.

Around 40 (51.3%), 69 (88.5%), 43 (55.1%) of the cyclone shelters were located near the sea, river and creek respectively. Shelters located closer to the sea were deemed unsafe by village authorities and by interview respondents. It was noted that community members would seek refuge in another shelter rather than seeking refuge in the shelters near the sea. Some of the shelters were located at the fringe of the village which made access a problem to villagers.

About 62 (79.5%) of the shelters plinth level were built above storm surge level. In a few cases, cyclone shelters were built over 5 feet of compacted sand, to raise the height of the shelter higher than the storm surges witnessed during cyclone Nargis. Safety of the structure itself was questionable, as respondents and participants felt that the foundation could get washed away by floods and storm surges, and the protection it would offer to community members was doubtful.

Access:

Around, 630 (87.5%) of respondents feel that they can access the cyclone shelter all year round and 90 (12.5%) of respondents will not be able to access mainly due to flooding, roads being damaged and lack of bridges across the creek. Concerning with disabled people only 9 (11.5%) of the cyclone shelters have access provision for disabled people.

Time taken to reach the shelter varied based on the distance of the HH to the cyclone shelter and also the prevailing weather condition and time of the day. Majority of the households can move to cyclone shelters during day and night time with their family during the peace time. 538 (75%) of the interviewed HH informed that could reach the shelter by foot within 20 minutes in normal times, where as 342 (47.5%) can reach the shelter within 20 minutes time during rain or storm due to accessibility problems. In addition to access problems, households are concerned about sick / elderly people, lack of lighting facilities during night.

It was highlighted that an early warning of at least 6 hrs before a storm or flood would give them sufficient time to reach the shelter. For others, a 6-hour advance warning would help them prepare boats, schooners or bullock carts to reach the shelter areas.

Figure 5, below shows the potential response of different households during the time of heavy rain/ floods. Study shows that majority 560 (78%) of interviewed HH's will move to school/ monastery Cum Cyclone Shelters etc which shows increased awareness on the safety during the onset of hazards.

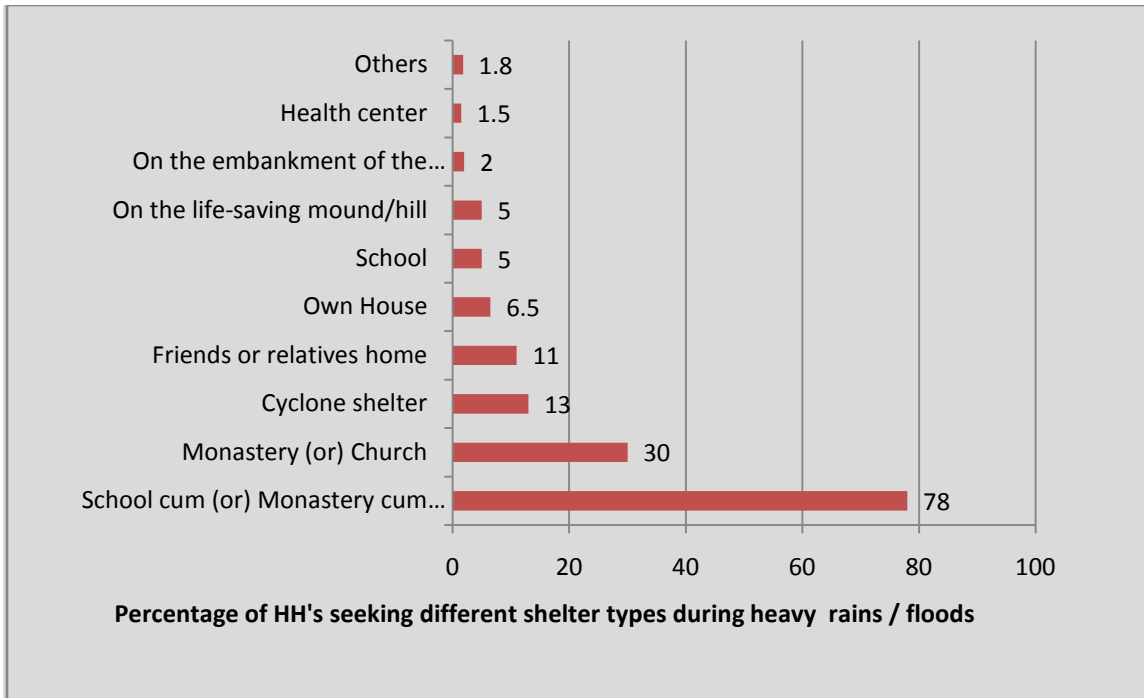


Figure 5: Shelter Types Sought by HHs During Heavy Rains/Floods

Facilities:

In addition to the rooms in the shelter, only 10 (12.3%) of the shelters had toilet facility inside the shelter while the majority of the shelters had toilet facility within the compound. Only 6 shelters of 10 which has toilet inside the shelter had separate toilet for women. Total number of toilets inside the cyclone shelter varied between 1 and 6. Lack of adequate toilet facility will be a major issue during the time of cyclone when the communities have to stay for longer duration. Further, 31 (38.27%) cyclone shelter had provision for drinking water and 26 (32.10%) for domestic use which are provided by tube well, rain water stored in containers and rest are open pond and well. Water available from open pond and well might get contaminated in case if the area is inundated during cyclone or storm surge and will not be safe to use.

Most of the cyclone structures mainly catered to providing shelter for people; however it does not address protecting the livestock or assets. Government built cyclone shelters which are three storied buildings can accommodate people as well as livestock and assets. Below Figure 6, shows the type of additional facilities available in the cyclone shelters assessed as part of the study.

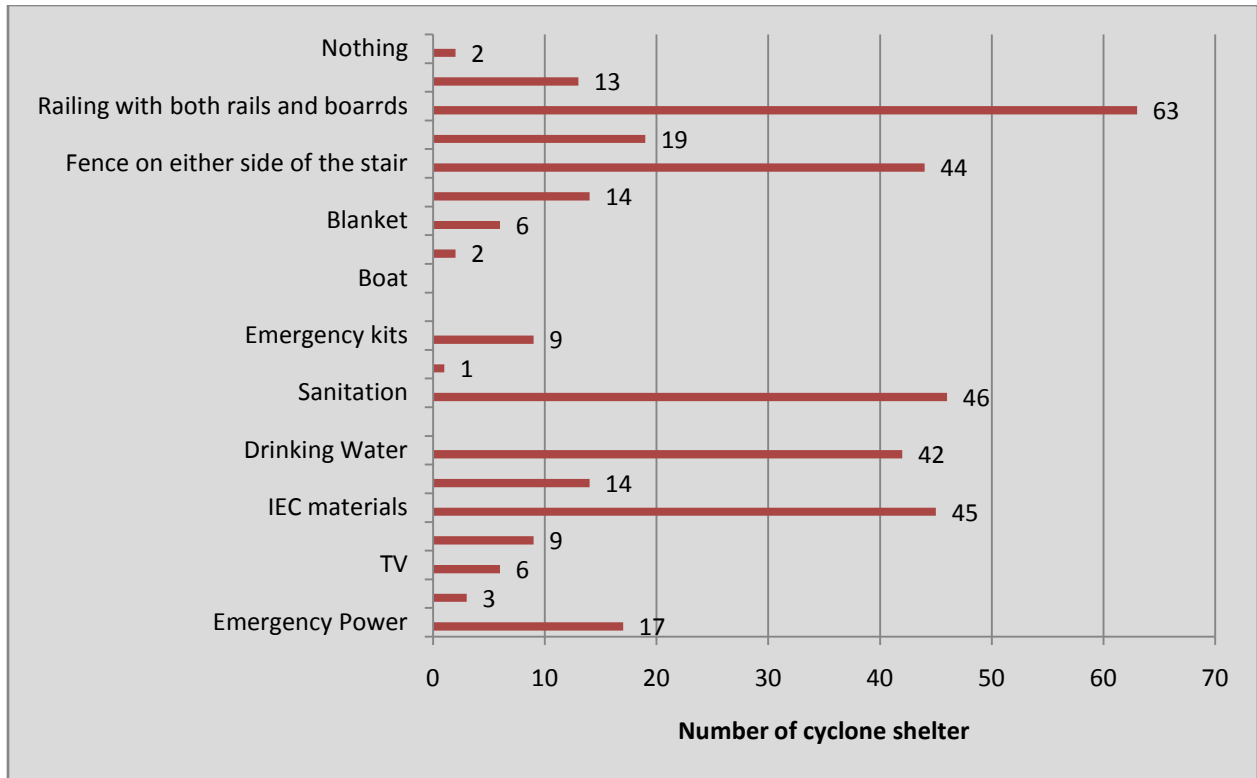


Figure 6: Facility available in the cyclone shelters

Cost

Cost of constructing cyclone shelter (core building cost) varies significantly based on the structural elements, size, and other facilities provided in the shelter. According to the data provided during the Key Informant Interview the minimum and maximum cost for constructing the cyclone is around 4,000,000 Kyat to 2,200,000,000 Kyat. Below Figure 7, provides the core cost of construction of assessed cyclone shelters.

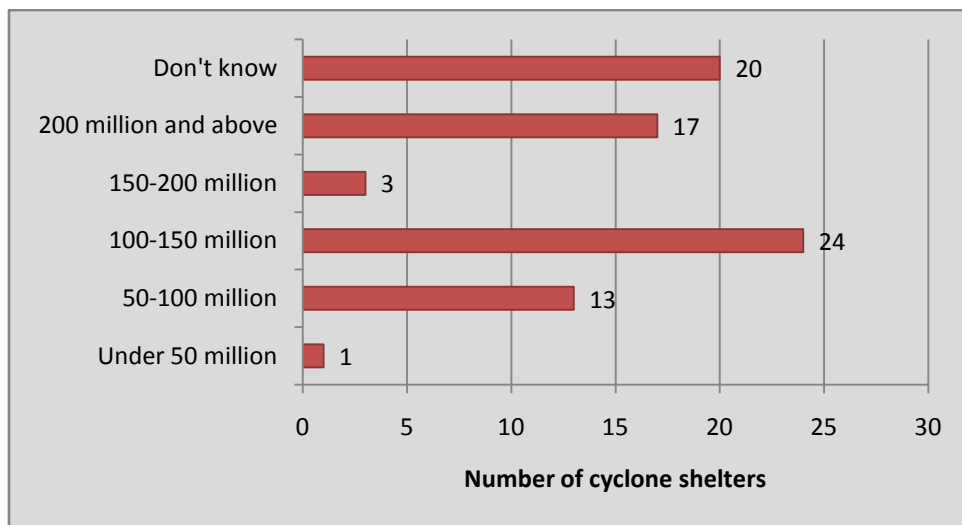


Figure 7: Cyclone shelters classified based on the cost of construction (core cost) in Kyats.

c. To evaluate the community's feeling of safety

Households' perception of a cyclone shelter basically lays in the strength of the structure itself, distance from the sea and river, height of the structure and its ability to shield people in the eventuality of a natural disaster such as floods or cyclones.

Figure 8, highlights the community feeling of safety while at cyclone shelters during cyclones and storm surges. Around 305 (42.4%) of the HH interviewed felt that its totally safe and 337 (46.8%) felt somewhat safe and 62 (8.6%) and 16 (2.2%) somewhat not safe and totally not safe.

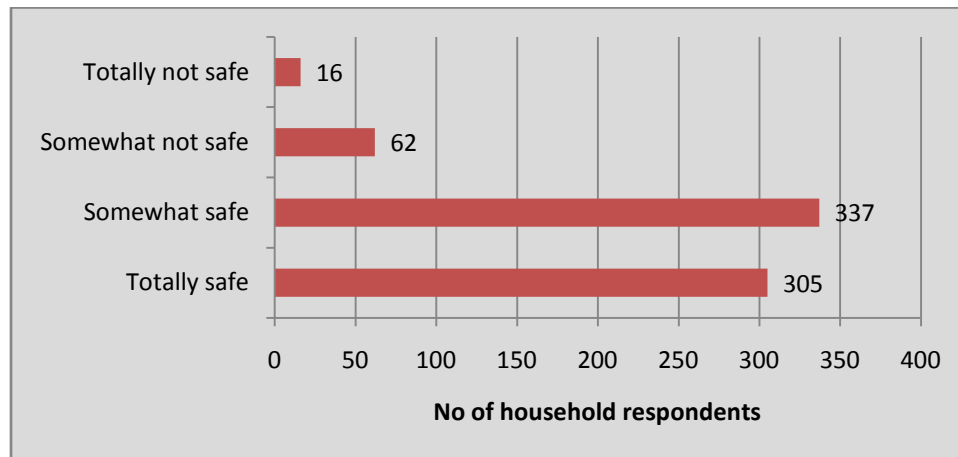


Figure 8: Feeling of safety while at cyclone shelters during cyclones and storm surges.

Around 560 (77.8 %)of respondents mentioned school cum cyclone shelter to be the safest compared to other shelters followed by Monastery / Church, Cyclone Shelter, friends or relative house etc in response to where they would take shelter in the event of another cyclone. Similarly when asked about where others in the community might take shelter in the event of another cyclone, 578 (80.3%) of the respondents mentioned school / monastery cum cyclone shelter followed by Monastery etc. The results of the study show that an overwhelming majority of households feel schools or monastery cum cyclone shelters meet the needs of the household and the community to a large extent it will mitigating losses to life during any natural calamity. Below Figure 9, highlights the reason for seeking shelter at school or monastery during the time of emergency.

It was evident from the interview and results that people preferred the safety of a school cum shelter over other buildings, simply because the structure appeared strong, the location was higher than most places, and the architecture provided protection to the building against storm surges and floods. Monastery cum shelters were rated safe, but “not as safe” as a school cum shelter, as the “structure” did not appear as strong, neither was the location on “higher ground”.

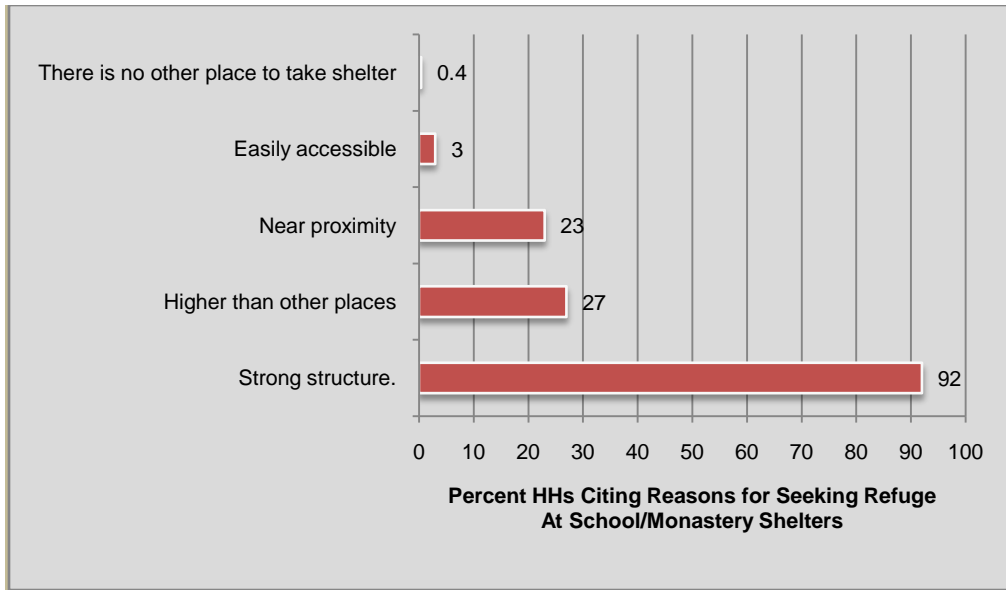


Figure 9: Reasons for Seeking Shelter at School or Monastery cum Cyclone Shelter

d. To assess community's feeling of ownership

While most cyclone shelters 73 (90%) were constructed by aid agencies and 8(10%) by government through contractors, study reveals that community had greater participation in site selection for the cyclone shelters. According to the Key Informant Interview, community members were closely involved in selection of 59 (76.6%) cyclone shelters and HH interview revealed around 672 (93.3%) of the interviewed HH interview were involved / participated during the site selection process and the community response to move to cyclone shelter during the time of emergency an feeling of safety.

Post construction, around 63 (80.8%) of the cyclone shelters have been transferred to relevant ministry and 10 (12.8%) to local authorities and 3 (3.8%) to community based organization and rest unaware of whom it has been trusted with.

e. To find out utilization of these buildings during peace time

Study found that 77 of 78 shelters (98.7%) of cyclone shelters¹ are currently being used normally and 74 (96.1%) are being used as School and 4 (4.9%) as Monastery. All KIs mentioned that the existing cyclone shelters are being used for school purposes during normal times and will serve as a cyclone shelter during emergencies. Monasteries served as centres for religious education and training during peace times as well as cyclone shelters during any emergency / natural disaster.

According to information, all community members were aware of the “persons” who keep the building keys and how to contact the person in emergencies.

¹ 3 were under various stages of construction

f. To assess the quality of buildings and their life spans before retrofitting them if initial construction is not fit enough

Study found that all the completed shelters are in usable condition and 59 (72.8%) are in good condition and 21 (25.9%) of in average condition and one shelter needed repair for use. Cracks noticeable in structural elements such as walls, roof etc and there is loss of plasters in wall, ceiling etc. Since most shelters have constructed since 2009, it is too early to assess the quality of the structures.

In some villages, a 5 meter high sand-compacted foundation was raised and the shelter constructed over the raised land. Participants noted that sand compacting was done to raise the building higher than the highest storm surge from Cyclone Nargis, almost 7 mts in height and repeated surge can wash / scour away the raised land.

g. To assess effective management on operation and current practice of maintenance plan

According to the Key Informant Interview, 15 (19.2%) of the cyclone shelters has established shelter/ school/ building management committee and 7 (9.0%) of shelters have schedule for regular maintenance work such as cleaning, termite prevention, reinforcing mounds between the buildings. About 179 (24.9%) of the households were aware of the management committee. In addition, 176 (98.0%) of the respondent who are aware of the management committee are aware of scheduled regular maintenance work being carried out in the shelters.

It can be ascertained that school cum cyclone shelters are maintained by school committees. School cum shelters pay for their own maintenance, through regular use and any small fees collected. Replacing broken glass windows, plugging holes in roofs, weeding and cleaning of the shelter was done on a regular basis by families from the community.

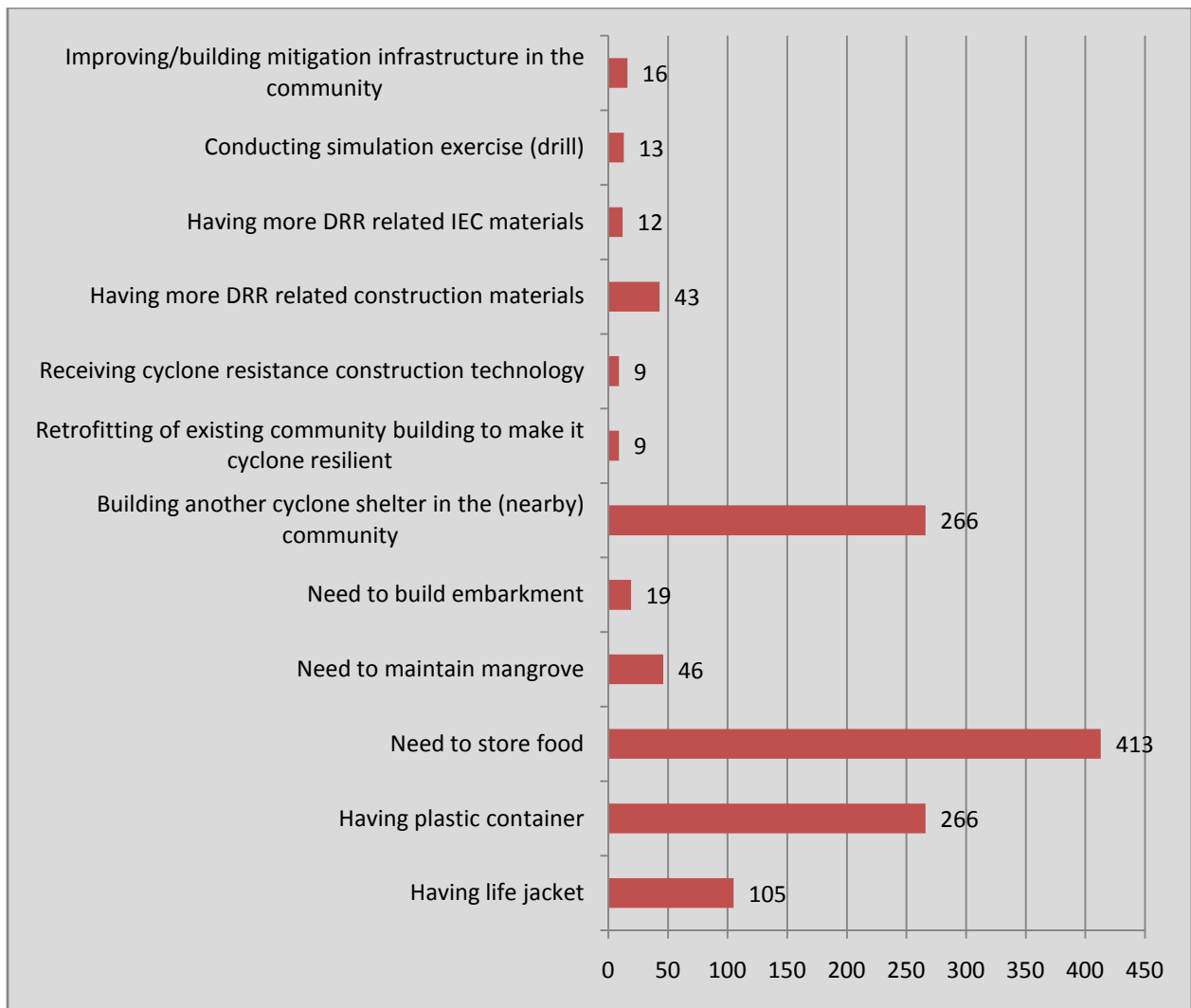
Aid agencies and monks helped in the maintenance of monastery cum cyclone shelters. Overall monastery maintenance was much lower and poor compared with the school cum cyclone shelters. Training was received by members of 2 communities in activities like plumbing, fixing roofs, and other small repairs. Planting trees to act as natural wind barriers was taken up in one of the communities.

Community Contribution: All participants expressed their desire to be able to contribute to the maintenance of shelters within their community. All were willing to provide labor for rebuilding, undertaking repairs, building access roads, cleaning premise, basically as one participant put it “we can provide unlimited labor, but not money as we are very poor”.

h. Unmet / future needs:

Household interview reveals that community recognizes the importance of cyclone shelters to protect their lives during the time of emergency. While agencies which constructed the shelters have provided basic infrastructure there are many unmet / future needs to protect and provide a

sense of security while they are in the shelters. In addition to the adequate toilet, water availability, adequate space for women, disability friendly, space for livestock and their valuables discussed in the previous section, other concerns of the households include adequate facility to store their food, need for provision of water storage facility, new cyclone shelter as the shelter will be overcrowded during the time of emergency. Figure below illustrates few of activities that are needed based on household ranking. There is also increasing recognition for other measures such as availability of adequate life jackets, protecting mangrove, know how on disaster resistant construction techniques to strengthen their homes, protect the cyclone shelter by constructing embankment as many of the shelters are one storey structures which can be affected during the storm surges. In addition the village level disaster management institutions (VDMC's), CBDRR interventions need to be strengthened and establish operational linkages with Township Disaster Management Committees and plans.



VII. Study findings for effective planning tool for future cyclone shelter construction practices

In general the assessment undertook in identifying and classifying types of cyclone shelters constructed in the Delta by various agencies. In addition, the study was able to evaluate existing cyclones both quantitatively and qualitatively on various structural and non- structural aspects and use of cyclone shelters and most importantly the community perspectives who are the real users of such structures at the time of emergency. Further, the study was able to document good practice, gaps and unmet community needs in those shelters. Below is the summary of key findings and recommendations for future cyclone construction practices.

1. **Type of Structure:** Post Nargis, designated cyclone shelter in Delta region exists in various forms such as stand-alone cyclone shelters, school cum shelters, hospitals cum shelters, monasteries cum shelters, government shelter, around 267 / 356 (75%) of the shelters constructed are school cum cyclone shelter followed by government constructed stand alone cyclone shelters and monastery cum cyclone shelters etc.

Based on the assessment, school cum cyclone shelters is currently the preferred approach as they serve dual purpose both as school in peace time and also as an emergency support function for evacuation. In addition most schools are located in the middle of the village and it is easy for access during the time of emergency. Among other socio-economic benefits, investing in schools with disaster resistant features as school cum cyclone shelters has many positive benefits such as, optimal resource utilization, critical infrastructure such as schools can be operational immediately after the event, enhancing awareness among the children's on disaster preparedness.

2. **Building Materials:** Majority of the shelters are made of reinforced concrete structure with brick wall which can withstand strong winds. However except few shelters majority of the roofing for the cyclone shelters are made of sheets/ tiles which might not withstand heavy winds.

While past experience shows that structural elements such as roofs made of sheets / tiles can be damaged extensively in case of storms, there is a need to look into viable options depending on the design life of the structure and resource available.

3. **Location:** It is important to identify safe and suitable land for construction of cyclone shelter (irrespective of type of structure) to ensure safe and quicker access to the people. While the study did not assess the location of cyclone shelter with respect to tsunami run height and inundation, it is important to consider during the site selection process as the coastal zones of Myanmar are also prone to tsunamis.

It was observed that communities feel it is unsafe to move into a cyclone shelter close to sea or river even if the shelter is designed to withstand cyclone wind speeds or storm surge.

In general study shows that school cum cyclone shelters which are located in the center of the village are easily accessible, whereas the new shelters which were constructed on the periphery village is not favored because of the distance. Further community participation in selection of land for cyclone shelter not only increases the awareness on the availability of cyclone shelter in their location but also to ways and time taken to move in case of emergency. In addition it not only enhances the ownership (as the were part of decision making) but also their willingness to contribute their labour and mobilize resources in maintenance of shelter.

4. Access: Study reveals that access to cyclone shelter during the time of emergency is an important criterion on which communities react. According to the assessment access to existing shelter for disabled people and also to move disabled (as many respondents prefer to stay back at home due to disabled or sick people in their family) needs improvement especially roads, bridges etc so that travel time to the cyclone shelter is reduced.

5. Facilities:

It is evident from the study that mere having cyclone shelter (structure) is not adequate for the communities to get the sense of safety when they move to cyclone shelter during the emergency. There is a need for adequate space / rooms, toilet facilities inside the shelter including for women, water supply both drinking space for livestock and assets, emergency power, emergency and first aid kits, adequate protection around the shelter embankment. Only few shelters have such provision and hence future shelter planning should take into above considerations.

6. Community Participation: Assessment shows the participation of community in site selection process enhances their awareness and importance of cyclone shelter and also the sense of safety and security when they are in the shelter. While very few cyclone shelters have management committee there is a need to establish similar committees with community participation to maintain the shelter. In addition linking the cyclone shelter construction activities with ongoing CBDRR work in the coastal villages will enhance their response and preparedness measures.

7. Management: While majority of the cyclone shelters are built by aid agencies and transferred to the Ministries, management of cyclone shelter exists in few schools cum cyclone shelters, however it is not widely being practiced. Further, findings from those shelters with management committee show that the committees are active in maintaining their shelter and they are willing to contribute resources both human and monetary to maintain the cyclone shelter. Hence further options need to be explored to establish appropriate management committee based on community participation in the existing ones and such systems need to inbuilt within the new cyclone shelter programming starting from initial consultations.

- 8. Complementary DRR activities:** Post Nargis, many development partners and NGOs have worked with communities to “Build Back Better” and also to enhance their capacities and resilience through disaster resilient housing, improving early warning dissemination systems, awareness programmes, CBDRR interventions, emergency and first aid kits, trainings and also through support of small scale mitigation activities. The impacts of such interventions are quite noticeable in terms of community’s knowledge and attitude on natural hazards and their associated risk and their sense of safety measures to move to safe shelter on receipt of warning.

Such complementary interventions need to be supported and sustained in order to enhance their resilience in all existing cyclone shelter areas and also to be programmed as part of the new cyclone shelter interventions. Further, the efforts at the community level need to be consolidated and linked with the Township Disaster Management Committees and Plans which the Government has identified as one of the priority activity under the MAPDRR.

VIII. Gaps and opportunities for future cyclone shelter needs

According to the UN-Habitat study as of 23rd February, 2010, there are a total of 358 cyclone-resistant community buildings (includes completed, under construction and planned), spread over 4246 villages, in 8 townships in the delta which is approximately 1 shelter for 11.8 villages in average.

Study also shows that 83.3% of cyclone shelter has been planned to cover 1 village and 16.7% of the shelters cover over 2 or more villages and their occupancy capacity varies from <100/ shelter to 1000-1200 / shelter.

Household interview highlights people prefer to go to cyclone shelter in case of emergency as they consider it as a safe place as compared to the pre-Nargis situation where people took shelter in various locations. Communities are very much aware of the importance of cyclone shelters to protect their lives. However, the current distribution of cyclone shelter is grossly inadequate covering <10% of the villages in the delta region. Further household interview reveals that cyclone will be overcrowded in case of existing shelters and it will be a major concern at the time of emergency. For e.g. In the wake of a storm surge or cyclone, HH’s feel that each cyclone shelter would bring in people from an average of 7 nearby villages (minimum 2 and maximum of 10 villages). 49 of 78(62.8%) respondents felt the need to have another cyclone shelter in the nearby community so that people are encouraged to move to cyclone shelter in case of emergency.

Hence it is important to identify and prioritize vulnerable communities, which do not have access / adequate shelters, construct new cyclone shelters, identify any strong and safe community buildings in those villages and assess their safety and if required retrofit strengthen existing structures to act as cyclone shelters not only in delta region but also in other States and Regions which face higher frequency of cyclone and storm surges. It is also important to consider hazards such as Tsunami which have longer return period during the future cyclone shelter programming

process as the costal areas are also prone to Tsunami. Investment in cyclone shelter will have a tangible impact in saving lives when complemented with sustained DRR initiatives undertaken by various NGO's and development agencies and also link with broader development initiatives such as school, infrastructure programs such as roads, water supply, sanitation etc.

Annex 1: List of Cyclone Shelters by Types and Villages visited as part of the assessment

Township	Village Name	Cyclone Shelter- Stand Alone	School cum shelter	Monastery cum shelter	Health cum shelter	Multi purpose Community Building	Total
Bogale	(Kyun Nyo Gyi) Kyun Hteik		2				2
Bogale	Aye		1				1
Bogale	Hpa Yar Thone Su		1				1
Bogale	Kha Naung		1				1
Bogale	Kwin Gyi		1				1
Bogale	Kyein Chaung Gyi		1				1
Bogale	Ma Gu		2				2
Bogale	Nyi Naung Wa		2				2
Bogale	Pan Be Su		1				1
Bogale	Phoe Yaung		1				1
Bogale	Pyin Boe Gyi	1	1				2
Bogale	Pyu Sa Khan		1				1
Bogale	Set San		1		1	1	3
Bogale	Thar Paung		1				1
Bogale	Wea Gyi		1				1
Deadye	Thauk Kyar		1				1
Deadye	Kyon Chin		1				1
Deadye	Htaung Hmu Chaung		1				1
Deadye	Than Di Thea Kone Lay		1				1
Kungyangon	Nget Gyi Taung			1			1
Kungyangon	Hmaw Bi		1				1
Kungyangon	Kawt Dun		1				1
Kungyangon	Wet Kaik		1				1
Kungyangon	Kyun Chaung		1				1
Kyaiklatt	Ein Yar Gyi		1				1
Kyaiklatt	Da Yin Kauk		1				1
Kyaiklatt	Ah Shey Sin Ku		1				1
Kyaiklatt	Kyon Ma Ngeit		1				1
Labutta	Baing Daunt Chaung (Pyinsalu Sub-township)		1				1
Labutta	Bi Tut	1	1	1			3
Labutta	Bone Gyi Kone			1			1

Labutta	Dee Du Kone (Hainggyikyun Sub-township)		1				1
Labutta	Gant Eik (Pyinsalu Sub-township)		1				1
Labutta	Kyar Kan 2		1				1
Labutta	Kyauk Hpyu Pein Hne Taung		1				1
Labutta	Kyauk Tan Gyi		1				1
Labutta	Kyu Taw		2				2
Labutta	Mway Hauk		2				2
Labutta	Myo Thit (Hainggyikyun Sub-township)		2				2
Labutta	Oke Twin (Hainggyikyun Sub-township)		1				1
Labutta	Pyin Ah Lan (Pyinsalu Sub- township)		2				2
Labutta	Pyin Kha Yaing (Hainggyikyun Sub-township)						
Labutta	Sa Lu Seik (Pyinsalu Sub- township)	1	1				2
Labutta	Sar Kyin		1				1
Labutta	Thin Gan Kone	1					1
Ngapudaw	Thet Kei Thaug (Hainggyikyun Sub-township)	1	1				2
Mawlamyinegyun	Aung Hlaing		1				1
Mawlamyinegyun	Ga Yan		1				1
Mawlamyinegyun	Hpa Yar Chaung Ta Khun Taing		2				2
Mawlamyinegyun	Ka Zaung		1				1
Mawlamyinegyun	Kyar Hone	1	1				2
Mawlamyinegyun	Kyun Chaung		1				1

un							
Mawlamyinegyun	Ma Bay		1				1
Mawlamyinegyun	Shauk Chaung		2				2
Mawlamyinegyun	Yae Twin Kone		1				1
Pyapon	Ba Wa Thit (Ah Mar Sub-township)		1				1
Pyapon	Day Da Lu (Ah Mar Sub-township)	1	3				4
Pyapon	Kha Naung Shan Kwin		1				1
Pyapon	Myo Kone (Ah Mar Sub-township)		1				1
Pyapon	Seik Ma (Ah Mar Sub-township)		1				1
Pyapon	Tei Pin Seik (Ah Mar Sub-township)	1	1				2
Total		8	68	3	1	1	81