Desk Review & Recommendations for the Improvement of Early Warning Formulation and Dissemination/Communication in Myanmar

Background information

Following the floods in August 2015 in Myanmar, the Inter-Cluster/Sector Coordination Group (ICCG) formulated a list of areas requiring further improvement for future natural disasters.[1] Early Warning (EW) and preparedness has been pointed out as one of these areas, notably the improvement of the Department of Hydrology and Meteorology (DMH)'s information on internet and social media, with clear alert advises, and ensuring that EW information reaches village communities with associated early actions to undertake.

In this context, the Disaster Risk Reduction Working Group (DRR WG) was requested to provide clear recommendations to the DMH to strengthen preparedness activities, in particular for the next Monsoon season. UNDP as the lead of the DRR WG's Policy Technical Task force carried out a desk review on EW from all the DRR WG's members at national and community levels. The document synthesizes the received information related to baseline surveys, lessons learned from the 2015's floods, studies, project documents and initial recommendations on EW. Those serve as a base to this analysis and its overall recommendations.

Definition of Early Warning Systems (EWS)

The EWS, as defined by the United Nations International Strategy for Disaster Reduction (UNISDR), is the *"set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss"*.[2]

Scope of the desk review

In terms of UNISDR terminology, the focus of this document is on two components of EWS: (i) monitoring and warning services; and (ii) dissemination and communication.[3] Within the scope of monitoring and warning services the focus is on the warning services (forecast products and tools). Both components influence the response capability at community level – mentioned below through simulations/drills and vulnerability perceptions. This focus is based on the request made by the ICCG to provide recommendations for the improvement of information provided by the DMH and channels through which EW reach communities. Following this work, it is not excluded that DRR WG do the same exercise on the other components of EWS if requested.[4]

The desk review and analysis are presented in three broad categories:

(i) Legal, policy and institutional framework for early warning and dissemination;

(ii) EW at community level; and

(iii) Recommendations on EW formulation and dissemination/communication.

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[1] ICCG, *Myanmar 2015 Floods Response After-Action Review*, 24th of September, 2015.

[2] UNISDR, *Platform for the Promotion of Early Warning (PPEW)*, Bonn, Germany, October 2005.

[3] UNISDR set 4 elements for EW Systems: (i) Risk Knowledge; (ii) Monitoring and warning services; (iii) Dissemination and communication; and (iv) Response capability.

[4] At this stage, the process allowed to collect information on "risk knowledge" and "response capability" but a further stocktaking would be needed.

Given that collected information and KAP surveys address all types of hazards, the scope of this document is not limited to hydro-meteorological events. Some recommendations on EW formulation and dissemination/communication target hydro- meteorological events while others are related to all types of hazards.

Below findings provide a summary of the information received form the DRR WG agencies. It is also acknowledged that information is limited given that the EWS at community level is relatively limited. In the meantime, recent flood events highlighted the importance of effective EWS and pointed out challenges that need to be addressed.

1. Legal, policy and institutional framework in Myanmar for EWS

a. ***Legal framework*** - The **Standing Order on Disaster Management** (2009) underlines the need to articulate a multi-hazard EWS and mandated the use of risk, forecast and warning information for orienting preparedness activities at various levels. The **Natural Disaster Management (DM) Law and Rules** (2013 and 2015) emphasis further the importance of EWS.

b. **Policy Framework** - The **Myanmar Action plan on Disaster Risk Reduction** (MAPDRR, 2012) sets the importance of "Multi-hazard early warnings system" in its component 3 with the goal to alert the population under threat (of an imminent disaster) in time so that they can take timely protective actions.

c. **Institutional Arrangement -**

(i) **Warning formulation/forecasting –** The **Department of Meteorology and Hydrology (Ministry of Transport)** is the government agency mandated to observe, analyze, predict, and provide warning services for hydro-meteorological hazards for protection of lives and properties, reduction of the impact of natural hazards, and sustainable resource management and development. The DMH also established the National Multi-hazard Early Warning Center (NMHEWC) which is already in operation.

The table 1 lists down DMH's range of forecast products, with daily and monthly weather news and reviews. DMH also issues "severe weather warnings" for storms/cyclones and floods through news, warning or bulletin (for flood). The Annex 1 provides a list of technical terms used in the forecast to describe the conditions.

Table 1: DMH Forecast Products

Source: DMH

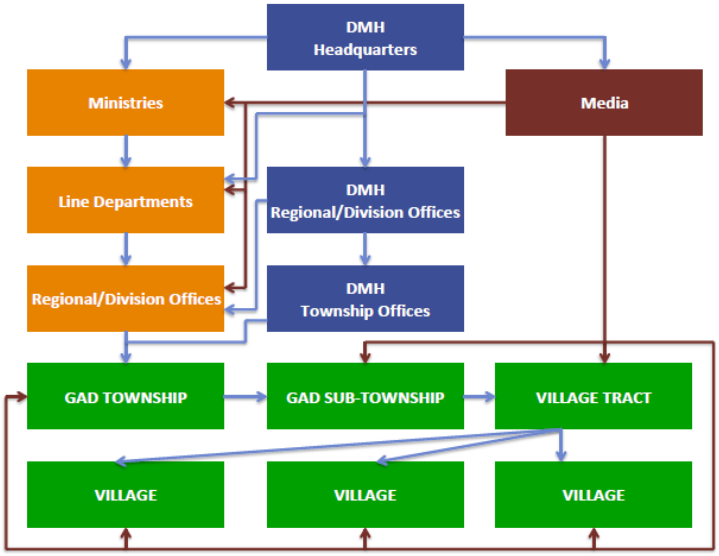
Type of Forecast	Time of Issuance	Forecast Validity
Daily Weather Forecast	7:00Am/12:00Am/2:00pm/ 4:00pm/7:00pm	24 hours
Sea Route Forecast	10:30 Am/1:30Pm	24 hours
Aviation Weather	Every 6 Hourly	(6) hours
Special weather	As per request and weather conditions	Depend on duration
Cyclone/surge	24-36 Hr before	-
Untimely Rainfall	Weather disturbance....	-
Strong Wind	March (15)	Pre Monsoon Period
Fog Warning	If necessary	-
Port Warning	Squally weather is expected	-

New Records	when new record occur..	-
(10)Day Weather Forecast	Every Month of 8/18/28	(10)days
Monthly Weather Forecast	Every Month of 28	(1) Month
General Weather Outlook for Monsoon Season	April 28	Monsoon Season
Seasonal Weather Forecast	April 28, June 28, August 28	Early, Peak, Late Monsoon

(ii) **Warning dissemination and communication –** In normal times, the **DMH** is responsible for the dissemination and communication of warnings from national to local levels (as shown by the table 2).

Table 2: Information Flow/Warning dissemination during normal times

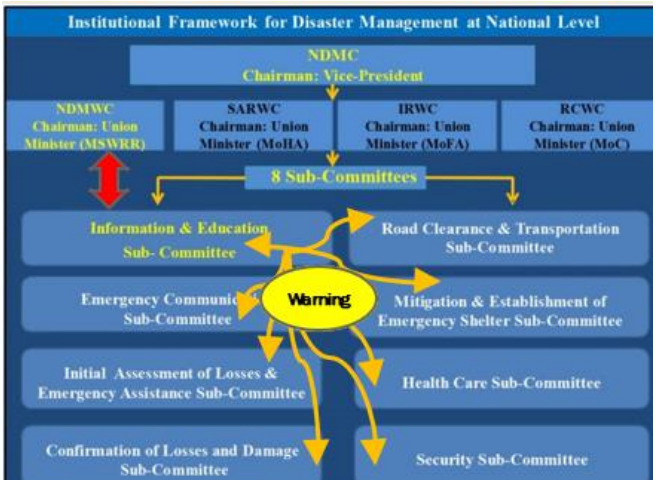
Source: RIMES/Regional Integrated Multi-Hazard Early Warning System for Africa and Asia



In a disaster setting (table 3), according to the National Disaster Management Committee (NDMC), the **Information and Education Sub-Committee (IESC, Chaired by Ministry of Information) - in which DMH along with other committee members,** is responsible for dissemination of timely information before, during and after disaster; issuing press release; and forecasting the potentially affected areas and likely conditions for each potential hazard. As per institutional mechanism for DM, Information and Education Sub-Committee exists till Township level, however there is no systematic information available on their functions and their effectiveness. The table 3 shows the IESC functions during a disaster, disseminating to Higher level, Committees and Sub-Committees and channels (e.g. Media), who will communicate the warning to Lower State/Region levels – those will then follow the communication chain and channels until the communities.

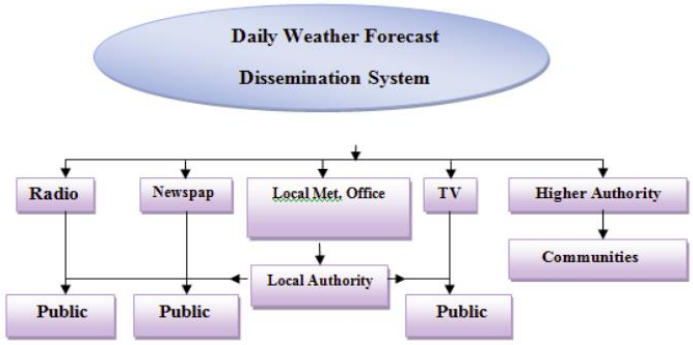
With the Standing Order formulation process at national level based on the DM Law and Rules, the functions of the IESC needs to be further clarified.

Table 3: Information Flow/Warning dissemination in emergency times



In terms of channels communicating the warning, in normal and disaster settings, several means are used to reach communities. Based on the daily weather forecast dissemination system, the table 4 identifies channels as the Higher Authority, the local authorities, the local meteorological office, radio, TV and newspapers.

Table 4: Warning dissemination channels - *Source: DMH/RIMES*



2. EW at community level

Over the recent years, many organizations or consortiums such as ADPC, RIMES, Malteser International, JICA, MRCS, MCCR and other regional/international partners have been supporting the DMH and the agencies to improve early warning systems in a multi-hazard framework. All these projects and interventions have specific interventions to improve the four components of early warning systems. DRR WG agencies provided information on their experience at community level in warning formulation and dissemination/communication.

a. Warning formulation/timing

As part of lessons learned of the post-2105 floods, many DRR WG agencies underlined the lack of understanding at local level formulated by the DMH. In this respect, there is a need to improve technical capacity for issuing actionable messages, taking in account local level needs and specificities (e.g. local language). The Post-2015 floods' lessons learned workshop on the Emergency Operations Center (EOC)[5] highlighted the importance to have at local level, DMH officers able to

[5] RRD and its partners, *EOC Lessons Learned Workshop on 2015 Floods and Landslide Response*, February 2016, Nay Pyi Taw.

provide support to local government officers/residents in order to have a better understanding of local conditions, improve timing and content of warning messages.

b. Types of hazards, community is informed about

Based on the baseline survey of the Myanmar Consortium for Community Resilience (MCCR), conducted in 5 townships (Labutta, Pathein, Pyapon, NgaPuDaw, Sittwe) with more than 600 respondents (table 5), over 90% are familiar with EWS for cyclones and strong storms.

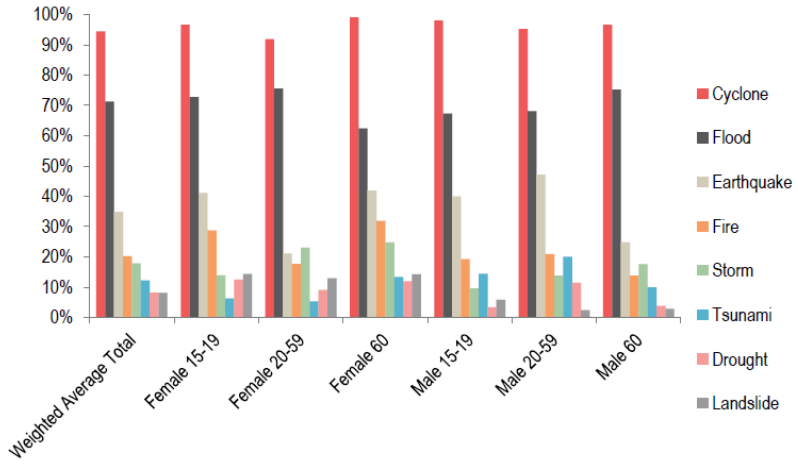
Table 5: Hazards for which community has EWS - *Source: MCCR*

Types of hazards Community is informed about	Baseline response (%)
Don't know	2
Cyclone/strong storm	93
Flood	29
Tsunami	4
Earthquake	4
Fire	4
Tornado/wind funnel	1

In Northern Rakhine State, as part Improved Disaster Management and Resilience against Natura Disasters programme, [6]the REACH Initiative organized a Knowledge, Attitudes and Practices (KAP) study stratified by gender and age, targeting population living in areas at risk from natural disasters in Maungdaw, Sittwe, Pauktaw, Minbya and Myebon townships. In the same line that MCCR survey, the REACH study shows that when asked how many natural hazards they identify, 95% of respondents identified cyclones, 71% identified floods, 35% identified earthquakes, 20% identified fires, 18% identified storms and 8% identified droughts and landslides respectively (table 6).

[6] The Consortium is led by the International Organization for Migration (IOM) and comprises ACTED, ADPC, Swanyee Development Foundation and Swiss Resources Centres and Consultancies for Development. The project focuses on a wide range of activities for DRR, including EWS.

Table 6: Proportion of individuals (%) identifying different hazard types occuring in their area (by sex/age) - *Source: Reach Intiative*[7]



In terms of awareness on early warning MCCR survey at baseline stage shows that only about 50% of respondents were aware of EWS in their communities. Confirming MCCR figures, the REACH study in Northern Rakhine State shows that when asked whether their community had any kind of structured EWS, 46% of people said yes and 50% said no, while 4% did not know.

Reach survey also indicates that when asked which hazard was the biggest problem for their area, 79% of survey respondents identified cyclones, 9% identified floods, 3% identified tsunamis, 3% identified earthquakes, and 5% identified a variety of other hazards. When asked how severe a problem the main hazard was for their communities, 88% of survey participants felt that it was a severe problem, 9% felt it was a moderate problem.

Those studies show hazard awareness and EWS when they do exist at community level are mostly focused on cyclones and floods. Multi-hazard EWS is still a challenge at community level, risk information and warning in a multi-hazard framework needs to be scaled up in Myanmar.

c. Channels for warning dissemination[8]

In MCCR study, 35% of communities consider receiving warnings from village authorities/leaders. VDMC members and task force members as part of CBDRM efforts represent another source of information on warnings at local level. As part of VDMC and through their commitment to other village groups, volunteers play a key role in warning dissemination as well as religious leaders who participate around 10% (table 7).

[7] Reach Initiative, *A study on knowledge, attitudes and practices (KAP) for disaster risk reduction in Northern Rakhine State, Assessment Report, Myanmar,* August 2015, http://www.themimu.info/sites/themimu.info/files/documents/Assessment_Report_KAP_for_DRR_in_Northern_Rakhine_REACH_Aug2015.pdf.

[8] This section focuses on sub-national authorities, community's leaders, volunteers and members.

Table 7: Channels for warning dissemination - *Source: MCCR*

Means for warning launch	Baseline response (%)
Don't know	2
Village authority/Leader	35
VDMC member	19
Task Force member	18
Other village volunteer	12
Religious leader	10
Neighbors	2
Government authority/official	2
	100%

Confirming the above figures, REACH study indicates that when asked which actors were involved in their EWS, 37% of respondents said village authorities, 15% said township authorities, 15% said village-level volunteers, and 4% said a disaster management committee of some form (with 50% reporting nobody in the absence of any EWS at all).

In conclusion, both studies indicate the need for more active engagement of all relevant stakeholders including community members and leaders in EWS process at local level.

d. How do communities receive warnings

Based on the MCCR study, 52% of communities receive warning information through alarms (gong, loudspeaker, and siren). Flags and signboards represent the second mean of giving warning at community level with 23%. In the meantime, this survey shows that only 10% of communities acknowledge receiving warning through radio. Phone, TV and other means/technology of warning are not often used at local level in this geographical area.

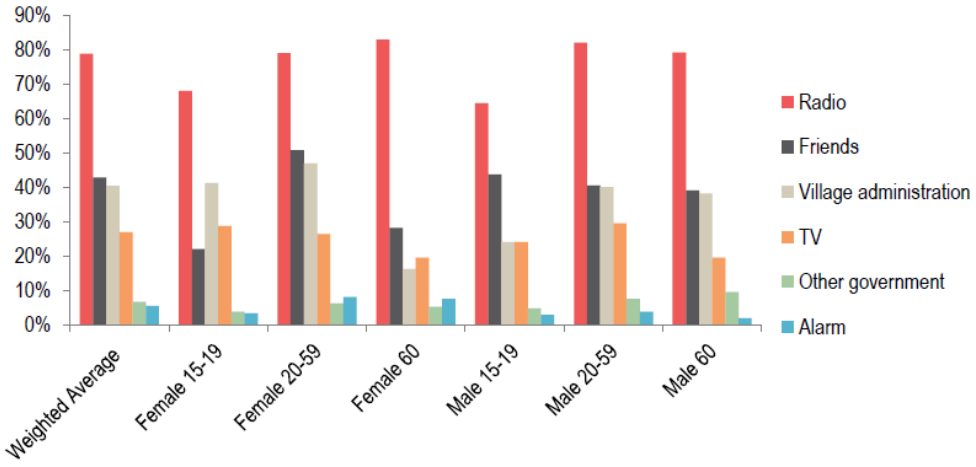
Table 8: How do communities receive warnings? - *Source: MCCR*

Means for warning reception	Baseline response (%)
Don't know	1
Alarm (gong, loudspeaker, siren)	52
Flags/signboards	23
Radio	10
Word of mouth/hse to hse	9
Phone	3
TV	3
Hold meeting	0
	100%

EWS Audits undertaken by RIMES in Lat Koki Kone Village Tract and Pyinsalu Sub-Township indicates that mechanisms for receiving and disseminating forecast/warning information is very limited – in the coastal areas, mobile phone connectivity is largely unreliable, even on a regular day. During severe weather conditions, the probability of dysfunctionality of mobile network is high. Power outage could also disrupt warning receipt from radio (and television).

In Northern Rakhine State, Reach survey shows another perspectives on the use of Radio and TV for warning communication (table 9). When asked about where they turned to for forecast information on natural disasters, 79% of survey participants cited radio and 27% TV. 42% identified friends, 40% village authorities, 7% various other government sources and 4% police. Alarm systems represents 5% of warning sources. Teenagers were less likely to use radio, with only 66% reporting it as an information source, while both teenage men and older women were less likely to hear from village administrators (16% and 24% respectively).

Table 9: Proportion (%) of individuals reporting different early warning sources for natural disasters, by sex/age - *Source: REACH*



In the same REACH survey, people were asked to rate the reliability of Radio, TV, township authorities, village authorities, friends/relatives, and the army as information sources, on a scale of 1-3 with 1 as unreliable, 2 as somewhat reliable and 3 as very reliable. Radio was rated as the most reliable forecast source, with 76% rating it "very reliable", followed by township and village administrators (75% each), TV (73%), friends/relatives (60%), and the army (58%). Older women were less likely to rate TV as "very reliable", with only 58% doing so.

In the EOC lessons learned of the post-2105 floods[9], as part of its Early Warning Program, JICA highlighted the necessity to educate villages in remote areas as vulnerability to disaster has strong correlation with the distance from city center due to communication, transportation, education, etc. In this context, TV and radio programs should be considered to obtain proper knowledge and actions to be taken.

e. Role of social Media and Internet as dissemination channels

Currently, there is limited information and evidence available on the role of these channels from the studies. During the recent floods, social media and Internet helped in dissemination of information but no quantitative study has been done yet on their coverage. Though, a first analysis highlighted that the information shared on social media and Internet widely are technical information generated

[9] OCHA, Lessons Learned Workshop on 2015 Floods and Landslide Response, Emergency Operation Center (EOC), February 2016, Nay Pyi Taw.

by the DMH and further disseminated by agencies such as RRD and others. In other terms, it needs to be adapted to the users (either in terms of translation or clear explanation). There is a need to use multiple tools for early warning to improve interoperability. The nature of the hazard onset and the warning time also play a key role.

In 2014, MRCS launched two mobile applications with the support of the Global Disaster Preparedness Center (GDPC) and American Red Cross. The users of the apps are individuals which vary from community members in villages, youth and other members in urban areas mainly across Myanmar also Myanmar diaspora who are out of Myanmar. The two MRCS applications are:

- MRCS First Aid App (2000-5000 users)- Providing basic first-aid messages in an easy-to-use manner through photos, videos and simple instructions which have been tailored from internationally accepted guidelines to the Myanmar specific context. The content of the app is approved by the Ministry of Health.
- MRCS Multi-Hazard App (around 1000 users) - Providing easy-to-use information for dealing with multiple hazards before, during and after the hazard. The content of the app is approved by RRD. The application also has the feature to send warning messages to users for various hazards. The information for these warnings comes from regional and international sources as of now. The next step would be to link the DMH early warning information to the MRCS multi-hazard app.

f. Simulation exercises (SIMEX)/drills

Another interesting insight from MCCR study is related to the SIMEX where communities participated in the project locations. MCCR's study shows that simulations/drills are exclusively organized for cyclones/storms and are better known by village and religious leaders. Acting as a crucial factor in community preparedness, SIMEX and drills need to be organized with an involvement of communities, at a regular basis and for all types of hazard the community is facing.

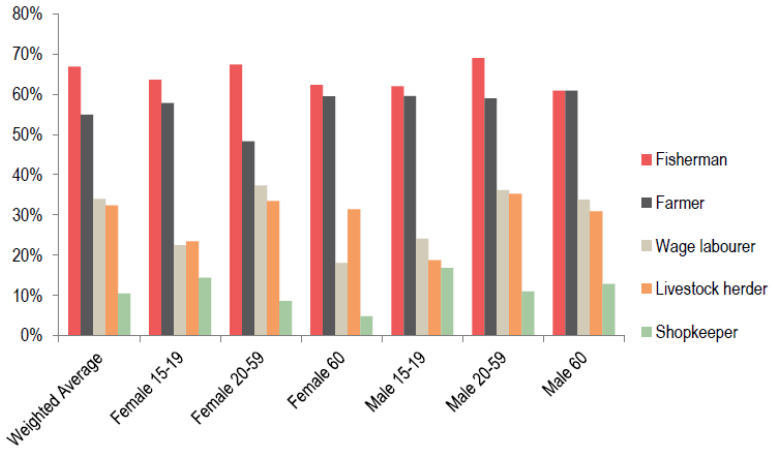
In 2015, through lessons learned on its program with DMH, ADPC pointed out a similar conclusion, highlighting that dissemination of flood alerts and warnings at subnational level needs to be improved through a better preparedness and institutional linkages – which could be tested through drills at local level.

In Lat Koki Kone Village Tract and Pyinsalu Sub-Township, DMH/ RIMES' EWS audits shows that 24/7 disaster preparedness mechanism is not established; the community disaster management committees convene upon receipt of warning information. While this is the mechanism observed in all communities in the country, community preparedness has to be more robust, especially in the coastal areas which are prone to low-lead time events.

g. How vulnerability is perceived by communities

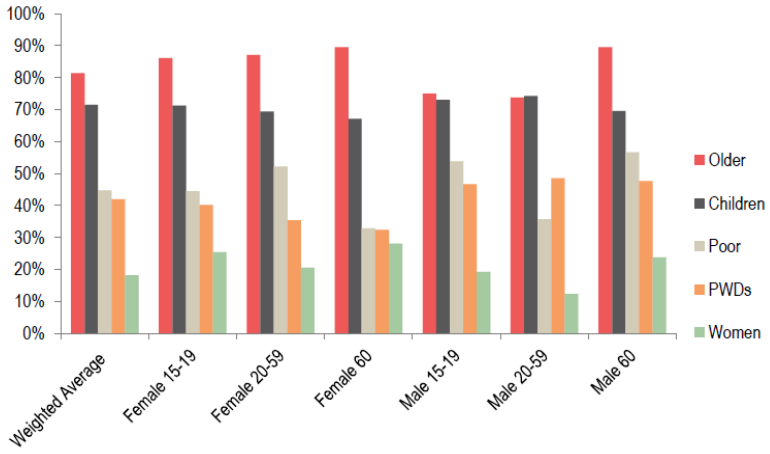
In Northern Rakhine State, REACH study shows that when asked which livelihoods they felt were more vulnerable to natural disasters, 67% said fishermen, 55% said farmers, 34% said wage labourers, and 32% said livestock herders. When asked which livelihoods they felt were less vulnerable to natural disasters, 48% said shopkeepers or businessmen, 40% said wage labourers, 9% said farmers and 8% said fishermen (table 10).

Table 10: Proportion (%) of individuals reporting different livelihoods perceived as more vulnerable to natural disasters, by sex/age - *Source: REACH*



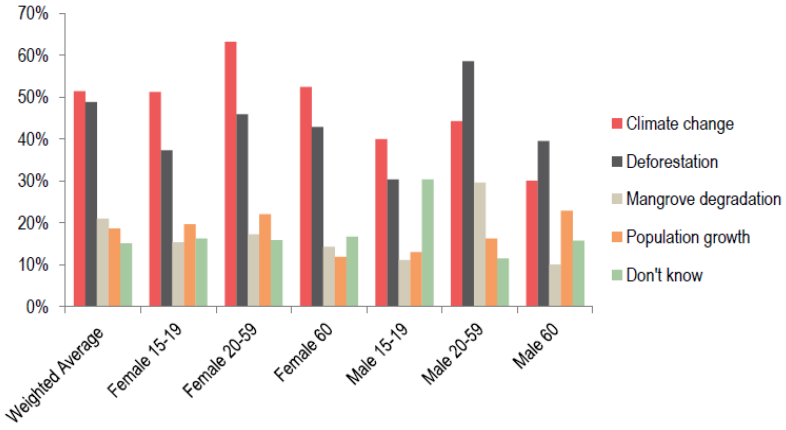
When asked which types of people they felt were more vulnerable to natural disasters, 81% said elderly people, 72% said children, 45% said poorer people, 42% said people with disabilities (PWDs), and 19% said women (table 11)). When asked which types of people they felt were less vulnerable to natural disasters, 78% said adults, 49% said richer people, 31% said men, and 8% said women.

Table 11: Proportion (%) of individuals reporting different population types perceived as more vulnerable to natural disaster, by sex/age - *Source: REACH*



Survey participants were asked to identify any changes in their area that might have made the impacts of natural disasters worse. 51% reported climate change, 49% reported deforestation, 21% reported mangrove degradation, 19% reported population growth, while 15% could not identify any changes. Comparatively fewer teenagers (34%) cited climate change as making the impact of natural disasters worse (table 12).

Table 12: Proportion (%) of individyals reporting different perceived drivers of worsening disaster impacts, by sex/age - *Source: REACH*



Above findings shows that the vulnerable groups in the community (elderly, women, children) needs special attention in early warning messaging and also need to strengthen the capacities to deal with climate change.

3. Recommendations for improvement of warning dissemination based on the desk review[10]:

Warning formulation

- Enhancing collaboration, among DRR-related institutions, for more coordinated EWS mechanisms between national and sub-national levels;
- Translating forecast/warning/risk information in local language;
- Recognizing local "situations" and "needs" by national government who should support local government technically;
- Awareness of EWS at community level is mostly on cyclones/storms; very little on other hazards as formulation is mainly based on cyclones/storms;
- Enhancing receipt of forecast/warning information in communities;
- Collecting systematically disaster data for all hazards to empower forecast/formulation or inform/prepare about potential scenario (accurate date and time of disaster occurrence (GAD, RRD etc.)
- Providing Agro-Met bulletins and Seismological news, and other information products based on hazards;
- Sectoral bulletins should be available in DMH website and other media, for enhancing understanding of forecasts/bulletins (e.g. for farmers);

For specific hydro-meteorological hazards:

- Translating forecast terminology through a risk-based language at local/community level, with explanation on terminologies, concepts and using graphical presentation of forecasts and warnings (maps, etc.). The purpose is to make language of the warning bulletins more understandable to non-technical users. The list of DMH terminology is provided in Annex 1;
- Improving public media messages on weather forecasts and early warning of extreme weather;
- Providing of specific water bulletin for the Dry Zone;
- Developing sectoral information materials on seasonal preparedness and sharing of the same to stakeholders in districts, townships and communities, for uptake;
- Implementing and strengthening real time monitoring of water level and establishing/upgrading the EWS along flood protection embankments and dams, observation, monitoring, data analysis,

[10] Summary of recommendations are primarily drawn from the extensive work of JICA, Malteser, MCCR, REACH, ADP and MRCS through project activities and also from RIMES through project activities and the Monsoon Forum at National level and Sub-National level in Ayeyarwaddy Delta.

prediction and forecasting systems to bring them in line with WMO and UNESCO/IOC standards for Tsunami;
- Collecting systematically disaster data (water level, rainfall at gauging stations, rainfall at upper catchment (DMH, ID etc.), rainfall at local area (GAD, people etc.))
- Installing CCTV, remote monitoring, telemetry, early warning and flood forecasting in large dams and establishing a main control center in the Irrigation Department; and
- Expediting the capacity building program framework being developed under the RIMES.

Warning dissemination/communication[11]

- Establishing clear SOPs on EW dissemination and communication from national to local levels;
- Improving horizontal and vertical communication and quality of technology networks for EW;
- Scaling-up and/or finding appropriate/reachable warning solutions for communities. Most common means of giving warnings are through alarms (gong, loudspeaker or siren). Use of other means or technologies is very limited;
- Expanding the coverage of electricity, landlines and mobile phones for better dissemination;
- Strengthening communication system/network, especially in coastal areas and Border States (facing poor internet and telephone connectivity). There is a general improvements in the end-to-end information communication system and development of telecommunications while remote communities encounter difficulties in receiving forecasts/warnings;
- Establishing/upgrading communication systems along the flood protection embankment;
- Using existing/Developing mobile application for disseminating/communicating advisories to broader stakeholders; or flood alarm system for mobile phones based on DMH warnings. The key recommendation regarding the MRCS apps is that DMH, RRD, humanitarian organizations and individuals should promote the usage of these freely existing resources;
- Increasing mobile messages (SMS) for the dissemination of warnings/advisories (with telecom companies);
- Increasing radio and TV use for the dissemination of warnings/advisories (based on the improvement of warning formulation (see above);
- Increasing social media use (e.g. Facebook) for the dissemination of warnings/advisories (based on the improvement of warning formulation (see above);
- Broadcasting DMH forecast several times a day through Farmers channel;

Capacity building:

- Increasing understanding of subnational authorities (Village authorities/leaders, VDMC and Task Force members) of forecast and impact at village level through explanations on terminology and a risk-based translation;
- Scaling up simulations and drills as systematic capacity building for communities to understand and act before, during and after disaster. When they exist, simulations/drills are mainly focused on cyclones/storms (over 90%), this need to address other hazards. In coastal areas, tsunami evacuation drills should be conducted at least once a year;
- Undertaking public awareness campaigns during normal times, among at-risk communities on the nature of warnings that could be received and corresponding actions to take; and
- Enhancing communities understanding on climate variability and its impact on existing hazards.

[11] With the Standing Order formulation process at national level based on the Disaster Management Law and Rules, the functions of the IESC should be further clarified.

Annex 1: Interpretation of Terms used in Daily Weather Reports

Source: DMH, Compilation done by MRCS / RIMES

Table 5. Interpretation of Terms Used in Daily Weather Reports

Parameters	Conditions	Interpretation
Rainfall	Isolated	Rainfall is likely to occur in 25% of the area of respective region or state
	Scattered	Rainfall is likely to occur in about 50% of the area of respective region or state
	Fairly widespread	Rainfall is likely to happen in 75% of the area of respective region or state
	Widespread	Rainfall is likely to occur in 100% of the area of respective region or state
	Cloudy	No rain is expected and sunshine is less or overcast
	Light	*Central Myanmar*: Less than .5 inch of rain is likely within 24 hours *Rest of the country*: Less than 1 inch of rain is expected in 24 hours
	Heavy	*Central Myanmar*: more than 1.5 inches of rain is expected in 24 hours *Coastal areas/rest of the country*: above 3 inches of rain in coastal areas within 24 hours
	Regionally Heavy	*Central Myanmar*: more than 30% of the area is likely to experience over 1.5 inches of rainfall within 24 hours *Rest of the country*: over 30% of the region or state is likely to experience over 3 inches of rainfall in 24 hours;
	Isolated Heavy	*Central Myanmar*: about 30% of the area is to experience over 1.5 inches of rain in 24 hours *Rest of the country*: around 30% of the region or state is expected to receive over 3 inches of rain within 24 hours
Squalls	Occasional	Squalls is likely to be experienced 4 to 6 times within 24 hours
	At time	Squalls if likely to be experienced 1 to 2 times within 24 hours
Sea	Light	Wave height is about 2-4 feet
	Rough	Wave height is about 4-8 feet