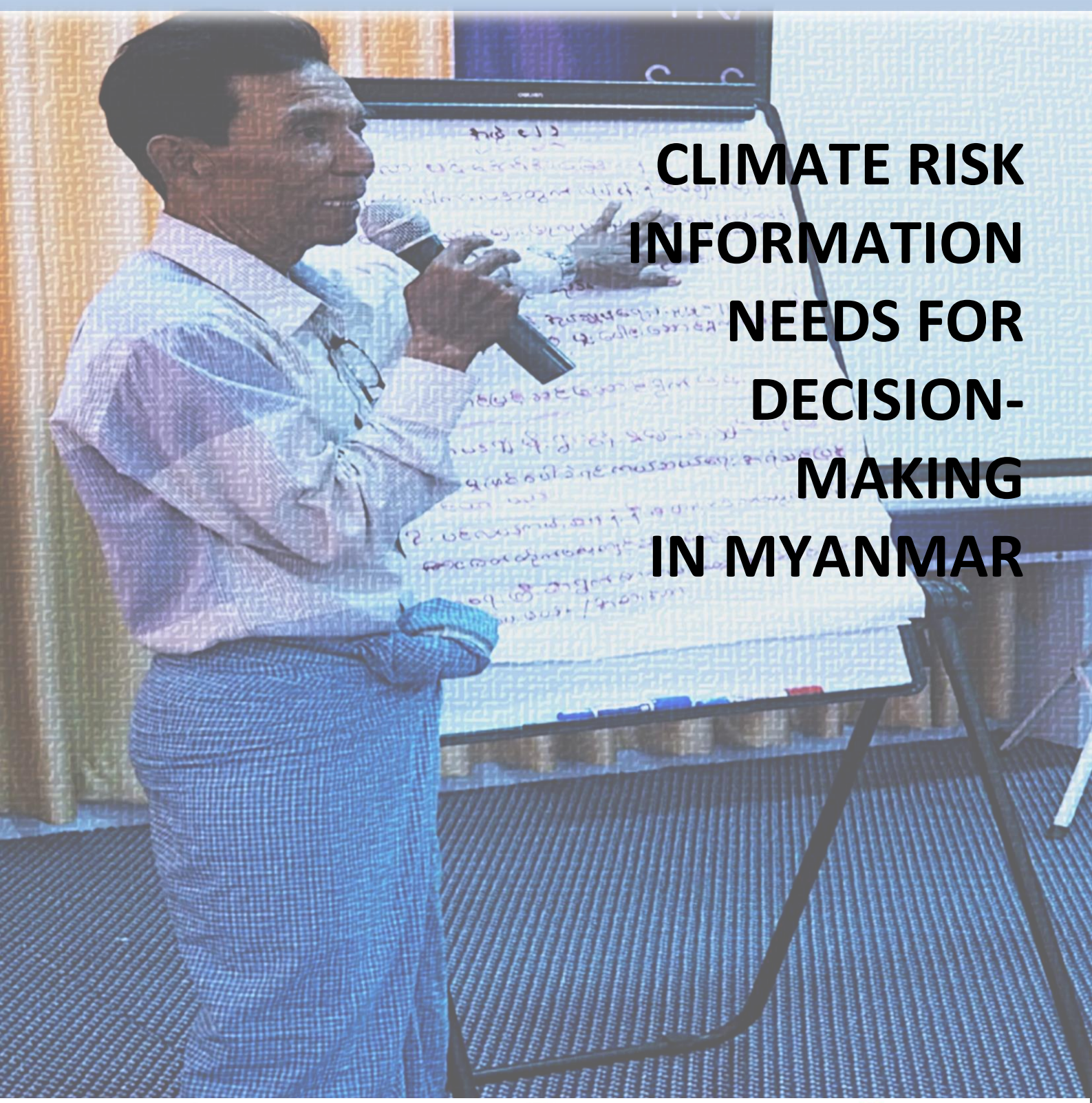

CLIMATE RISK INFORMATION NEEDS FOR DECISION-MAKING IN MYANMAR

RIMES

BRACED Building Resilience and Adaptation to Climate Extremes and Disasters

UN HABITAT FOR A BETTER URBAN FUTURE

UKaid from the British people

Department for International Development

This research has been completed through the partnership of Myanmar's Department of Meteorology and Hydrology (DMH) and the Regional Integrated Multi-Hazard Early Warning System (RIMES), with support from the Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED).

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Acronyms

AAM	Action Aid Myanmar
BRACED	Building Resilience and Adaptation to Climate Extremes and Disasters
CBDRR	Community-Based Disaster Risk Reduction
CSO	Civil Society Organization
DAN	Disaster Alert Notification
DMH	Department of Meteorology and Hydrology
DOA	Department of Agriculture
DOF	Department of Fisheries
DOPH	Department of Public Health
DRR	Disaster Risk Reduction
DRRWG	DRR Working Group
FGD	Focus Group Discussion
FM	Frequency Modulation
GAD	General Administration Department
IPRD	Information and Public Relations Department
IWRUMD	Irrigation and Water Resources Utilization and Management Department
MRCS	Myanmar Red Cross Society
MRTV	Myanmar Radio and Television
NGO	Non-Government Organization
RHC	Rural Health Center
RIMES	Regional Integrated Multi-Hazard Early Warnings System
RRD	Relief and Resettlement Department

SIM	Subscriber Identity Module
SMS	Short Message Service
SSB	Single Side Band
TDMC	Township Disaster Management Committee
TMD	Thai Meteorological Department
UN	United Nations
UN-Habitat	United Nations Human Settlements Programme
UNICEF	United Nations Children's Fund
VDMC	Village Disaster Management Committee
WMO	World Meteorological Organization
WV	World Vision

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1. INTRODUCTION

1.1 RATIONALE

Based on analysis of data from 1996-2015, Myanmar was ranked second in long-term climate risk index (Kreft, et al., 2016), indicating higher impacts of climate events within the 10-year period. This, even with Myanmar recording the least number of climate events among the countries included in the list (i.e. Myanmar recorded 41 climate events; the nine (9) other countries had climate events ranging from 44 to 283).

The current socio-economic conditions in Myanmar make it more susceptible to impacts of hazard events – cutting across lives, livelihoods and assets. Hazard impacts are disproportionately higher on the poor and vulnerable. With high degree of poverty in Myanmar's rural areas, even low-intensity hazards have big impacts on households. In rural communities, the poor often live in remote areas in low-quality housing, and lack access to basic services and local infrastructure, all of which affect their ability to deal with hazard events (Government of the Union of Myanmar, 2015).

Historical hazard events, and their impacts, offer views on the susceptibility of the vulnerable. Analysis suggests that climate-related events are likely to be exacerbated by climate change, and their impacts aggravated by environmental degradation (ibid), which are expected to redound to increased economic and social losses.

Climate information of various timescales (historical data, 1-3 days forecast, 5-10 days forecast, monthly and seasonal outlook, and long-term climate change projections) could, when applied seamlessly and meaningfully, reduce the impacts of hazards and promote productivity. Effective disaster risk management/reduction and improved resilience requires ingestion of climate information of different timescales in plans and decisions.

Understanding of capacities and gaps in climate information generation and application could guide interventions for enhancing availability, understanding, translation into sector-relevant information, and application of most viable response options, for improved disaster risk reduction and resilience.

Figure 1 provides the conceptual framework for this study.

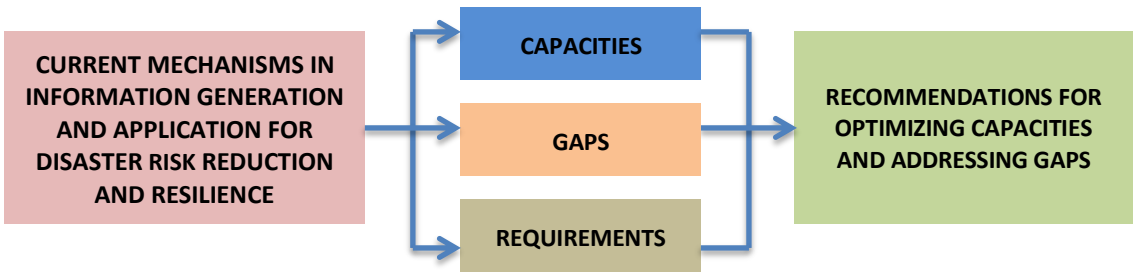

Figure 1. The research builds on identified capacities and gaps, in current mechanisms in information generation and application for disaster risk reduction and resilience, in providing recommendations for optimizing capacities and addressing gaps.

1.2. PROJECT AND RESEARCH CONTEXT

BRACED, a suite of capacity building projects for strengthening community preparedness, disaster risk reduction, climate change adaptation, sustainable development and resilience, is implemented in Myanmar to assist communities-at risk in putting in place evidence-based mechanisms to effectively enable communities-at risk to prepare for, respond to, and recover from climate events. BRACED is implemented in Myanmar, the latter being one of the most vulnerable countries to climate hazards, both current and potential. BRACED's work focus is both on influencing regulations and policies vis-à-vis improved disaster risk reduction, climate change adaptation, sustainable development and resilience; and provision of capacity building which is driven by urgent and immediate requirements of communities. BRACED, through multi-pronged interventions, is aimed at contributing to Myanmar's improved capacity and reduced vulnerability in managing current and future climate risks.

This research looks at capacities, gaps, and requirements in end-to-end forecast generation and application, for providing a road map, to guide national and local government decision-makers, non-government institutions, and UN organizations, and other development institutions, in pursuing development initiatives, integrating informed disaster risk reduction and climate adaptation initiatives, for sustainable development and improved resilience.

1.3 GOALS AND OBJECTIVES

This research aims at informing development initiatives that responds to capacity gaps and requirements of stakeholder sectors in Myanmar in relation to mitigation and management of risks relevant to climate variability and change. The research concentrates on BRACED townships of Dagon Seikan Hpa-An, Keng Tung, Kyauk Phyu, Labutta, Mawlamyine, and Meiktila; and select communities therein. Figure 2 identifies the various townships and communities of focus of this study.

These townships were prioritized considering differential hazards, risks, and capacity building requirements, with respect to various zones (i.e. coastal, central dry, and hilly areas) in Myanmar.

Outputs from this research could provide a roadmap for government authorities, non-government organizations, and development institutions in designing, prioritizing, and implementing capacity development initiatives for improving generation, interpretation, translation and application of different lead times of information for short, medium and long term plans and decisions.

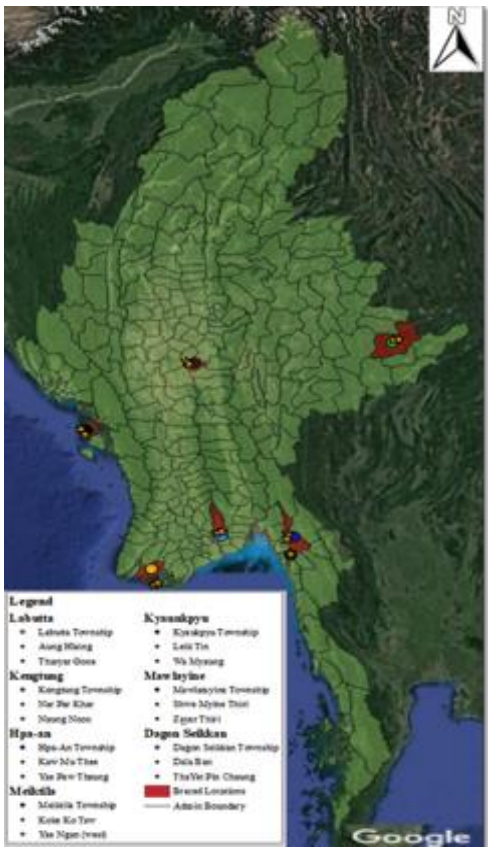

Figure 2. Townships and communities of focus of this study

Feeding into the general goal of the research, the

following are the objectives:

- identify capacities, gaps and requirements, in BRACED-priority townships and communities, in climate information receipt, interpretation, analysis of sector-relevant potential impacts outlook and application of viable response options relevant to anticipated potential impacts
- provide recommendations for improvements in the end-to-end generation and application of climate information, for key sectors, viz. agriculture, livelihoods, water resources, health, energy, disaster management, local government, development, and other relevant sectors
- provide a framework for capacity development in end-to-end forecast generation and application, for guiding government officials, development organizations, and NGOs, in pursuing institutional priorities, programs, and projects in disaster risk reduction, climate change adaptation, and resilience, with focus on townships and communities

1.4 METHODOLOGY

This research is undertaken through the following:

- **Desk review of reports from National and Regional Monsoon Forums and capacity assessments in disaster risk reduction and climate change adaptation**, for:
  - capturing capacities and gaps in forecast generation, communication, translation, and application as revealed/identified in various Monsoon Forum events in Myanmar, from national to sub-national levels;
  - synthesizing relevant documentation by the government, UN organizations, development institutions, and research entities on the capacities and gaps of stakeholder sectors and communities, in relevant areas in Myanmar, in informed disaster risk reduction/preparedness, climate change adaptation, and resilience

- **Focus group discussions (FGDs) in BRACED townships and select communities**, for:
  - validation of information gleaned from reports and relevant other documentation
  - obtaining further information, experiences, and insights, for addressing information gaps

  In townships, the FGDs were focused on Township Disaster Management Committees (TDMCs), which is led by the Township Administrator, and with membership of decision-makers from various sectors. The TDMCs are mandated to lead and coordinate early warning/ preparedness/ disaster risk reduction activities in the township, in collaboration with mandated institutions at the national, regional, district, and community levels. The structure and composition of TDMCs are provided in Annex 1. In communities, the FGDs gave focus to Village Disaster Management Committees (VDMCs). The VDMCs are the focal institution in leading and facilitating early warning/ preparedness/ disaster risk reduction activities at the grassroots level. Annex 2 elucidates the structure and composition of VDMCs.

  The TDMCs selected in this study were of Dagon Seikan Township in Yangon Region; Hpa-An Township in Kayin State; Kengtung Township in Shan State; Kyaukpyu Township in Rakhine State; Labutta Township in Ayeyarwady Region; Mawlamyine Township in Mon State; and Meiktila Township in Mandalay Region.

In each township, two (2) most at-risk communities/villages were selected for FGDs. The selection of most-at-risk communities were undertaken in discussion with TDMCs, DMH, and partner institutions, based on:

- recurrent exposure to climate hazard
- high levels of vulnerability and low coping capacities

The selection of most at-risk communities/villages for FGDs were strategized, to capture experiences of population exposed to recurrent hazards, and their impacts; and glean optimum capacity building requirements in terms of receipt, understanding, conversion into sector-relevant potential impacts information and development of viable response options, and application thereof into plans and decisions.

Civil Society Organizations (CSOs)/Non-Government Organizations (NGOs) in townships and communities participated in FGDs, vis-à-vis their contributions in community capacities, and requirements in enhancing early warning/preparedness/disaster risk reduction.

Annex 3 provides details of FGD participants.

Outputs of this study have been presented in the National and Regional Monsoon Forum events, for validation, stakeholder inputs and adoption of recommendations. Stakeholders (details are provided in Annex 4) in the 19th National Monsoon Forum, convened in Nay Pyi Taw on 25 October 2017, and in the series of BRACED-supported Regional Monsoon Forum events (i.e. Kayin State on 30 October 2017; Mandalay Region on 30 October 2017; Mon State on 1 November 2017; Shan State on 1 November 2017; Ayeyarwady Region on 6 November 2017; Yangon Region on 8 November 2017; and Rakhine State on 10 November 2017) expressed conformity with the research outputs, and provided emphasis on the requirement for robust and sustained mechanisms for building capacity of users in utilizing climate information of various times, for informed plans and decisions.

1.5 SCOPE AND LIMITATIONS

This research is focused on climate information needs of TDMCs and VDMCs in Dagon Seikan, Hpa-An, Kyaukphyu, Kengtung, Labutta, Mawlamyine, and Meiktila Townships. The composition of TDMCs and VDMCs cuts across sectors, and hence, information requirements of key sectors (i.e. agriculture, fisheries, livestock, water resources, health, energy, disaster management, local government, and others, as relevant) are undertaken in the analysis.

Climate information, in this study, is taken in the context of information of various timescales (i.e. historical data, 1-3 days forecast, 5-10 days forecast, monthly outlook, seasonal outlook, and climate change projections generated by DMH, as the nationally mandated institution for multi-hazard, multi-timescales information), in an effort to provide guidance for improving preparedness/disaster risk reduction vis-à-vis recurring hazards, short-lead time hazards, slow-onset hazards; and long-term climate change adaptation.

Analysis and recommendations, in this study, are not limited to hazard risks management. In an attempt to shed insights to stakeholders in Myanmar on the utilization of climate information,

analysis and recommendations include the use of climate information for resources allocation and management.

Myanmar is at a rapid stage of development, ushered by the change in political landscape. Remarkable development in technology, particularly in telecommunications, has been manifest in less than 5 years. This development in technology fed into significant capacities built in receiving information in many communities. With continuing telecommunications infrastructure, this capacity is expected to continue to evolve and improve.

Significant contributions in local capacities in early warning/disaster risk reduction/climate change adaptation have been, and continue to be, provided by numerous international and local NGOs/development organizations. These contributions have been valuable in increasing capacities in various levels.

DMH works with the World Meteorological Organization (WMO) and other partner institutions, RIMES included, in enhancing its capacity in monitoring, analysis, prediction, warning formulation, and dissemination of information. These interventions contribute to the continuous improvement and evolution of DMH's capacity.

Risks change over time and space, largely driven by the changing magnitudes and frequency of hazard events, increasing population in at-risk areas, changing patterns of livelihoods and poverty, and environmental degradation.

All these factors are expected to be absorbed into the evolution in user requirements, in different levels and sectors in Myanmar. Periodic assessments of information requirements in various levels and sectors, thus, are required for informing capacity building interventions.

2. Current Status of Myanmar's Information Generation and Application System

2.1 GENERATION, DISSEMINATION OF FORECASTS/WARNINGS AND RECEIPT OF FEEDBACK

DMH is Myanmar's mandated institution in observing, analyzing, and generating warnings for, hydro-meteorological and geophysical hazards. Through its network of observation stations, model outputs received from various WMO-recognized global and regional centers, and analysis of potential manifestations of primary and secondary hazards, DMH issues forecasts/warnings.

DMH currently has 125 observation stations, spread across the country, 51 of which contributes to WMO's global data. The addition of its radars, established recently in Kyaukphyu, Yangon and Mandalay, has significantly improved weather observation, and consequently, weather forecasts. DMH has a total of 13 forecasters; its headquarters in Nay Pyi Taw is closely linked to its regional/district offices for dissemination of forecasts/warnings up to townships; other key government institutions involved in forecasts/warnings dissemination are Relief and Resettlement Department (RRD) and General Administration Department (GAD).

Table 1 provides DMH multi-timescales climate information products.

Table 1. DMH Climate Information Products

Product	Details
Observation Data	
Daily Observation	New recorded in rainfall and temperature, as observed
Information Generated and Issued Regularly	
Daily Weather	Updated daily, with information on rainfall and temperature for subsequent 2 days
10 Days	Issued every 8th, 18th, and 28th of every month
Monthly Outlook	Issued every 28th of every month
Seasonal Outlook	Issued on 28th April, with updated provided on 28 June and 28 August
Warnings	
Cyclone Warning	As required
Heavy Rainfall Warning	As required, during the wet season
Untimely Rainfall Warning	As required, associated with weather disturbances during the dry season
Flood Bulletin	As required
Fog Warning	As required
Sector-Specific Information	
Aviation Weather	Every 6 hours
Agro-met Bulletin	Every 10 Days; with experimental location-specific 3 Days, 5 days and 10 Days information through DMH-RIMES collaboration for various area
Information Provided Upon Request	
Special Weather	As required
Long-Term Climate Change	
Climate Change Projections	Downscaled information generated for select regions; downscaling of climate change projections for BRACED-priority regions have been completed and integrated in various BRACED capacity building programs

Generated forecasts/warnings are disseminated through various mechanisms:

- **fax**, which remains as the official information dissemination mechanism from DMH to stakeholder ministries and departments;
- **email**, also considered as another official information dissemination channel for dissemination of forecasts/warnings, from DMH to government institutional stakeholders;
- **website** (http://www.dmh.gov.mm), where all the updated information products from DMH are available
- **tri-media** (i.e. print, radio and television), for dissemination to the public
- **social media** (i.e. Facebook, https://www.facebook.com/dmhmoezalanaypyitaw/?hc_ref=ARSvIE2Cn4uAFbe4rXJ4rvm03bPLsCiT7PPf9Xtx_1x-3d3AOVkwXncU84pnT_vXnEU), which was initiated by DMH in 2015, per recurrent demand from stakeholders from National and Regional Monsoon Forums

Figure 3 elaborates on DMH observation, information generation and dissemination processes.

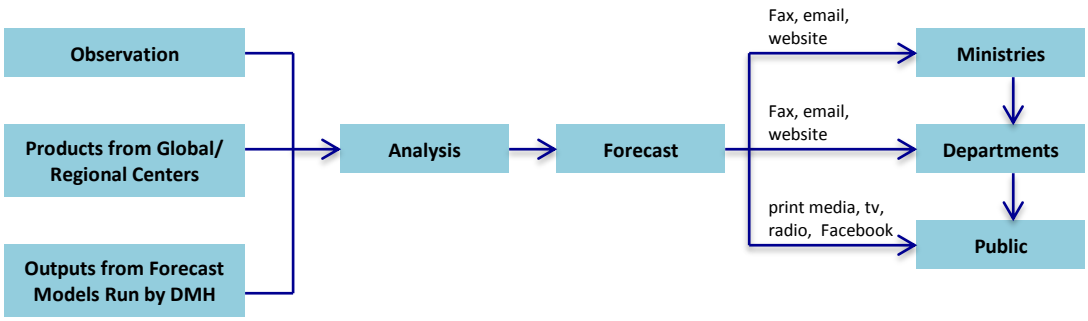

Figure 3. DMH's process for forecast (daily, 10 days, monthly and seasonal) and warnings generation and dissemination to stakeholders.

Climate change projections have been updated and downscaled for various regions (including for BRACED priority regions) and shared to stakeholders through workshops, trainings, and printed information materials.

Underpinning information of various timescales, daily observations are made available by DMH through its Facebook Page. Long-term, time-series historical data is available from DMH, albeit with associated cost, upon request. For government institutions, inter-ministerial coordination is required for obtaining time-series historical data, free-of-cost.

Receipt of feedback, from information users, is largely through Facebook and Monsoon Forum events, where DMH interfaces with stakeholders. Respective ministries/departments take responsibility of dissemination of forecasts/warnings, to line departments up to township GAD. Onward dissemination of forecasts/warnings to communities lies within the responsibility and mandate of GAD.

2.2 RECEIPT AND UNDERSTANDING OF CLIMATE INFORMATION, ANALYSIS OF OPPORTUNITIES AND RISKS, AND INFORMED PLANNING AND DECISION-MAKING

2.2.1 Dagon Seikan Township

2.2.1.a Current Mechanisms of Climate Information Receipt, Understanding, Analysis and Application in TDMC

Dagon Seikan's most significant climate concern is flood (urban and coastal flood; coastal flooding is especially a concern due to the combination of heavy rainfall and high tide), as confirmed by 91% of FGD respondents; other climate hazards experienced are heavy rainfall (55%) and thunderstorms (18%). Although Dagon Seikan is a costal township and is affected by cyclones, respondents find flood a key concern, due to its annual recurrence. In terms of magnitude of impacts, the worst hazard experienced were Cyclone Nargis in 2008 and flood in 2016.

At the TDMC, 100% of respondents confirm that climate information is accessible. Information accessed is largely limited to daily forecast (62% of respondents) and warnings (storm surge (54%), heavy rainfall (46%), flood (23%), cyclone (15%) and strong wind (15%), in Figure 4.

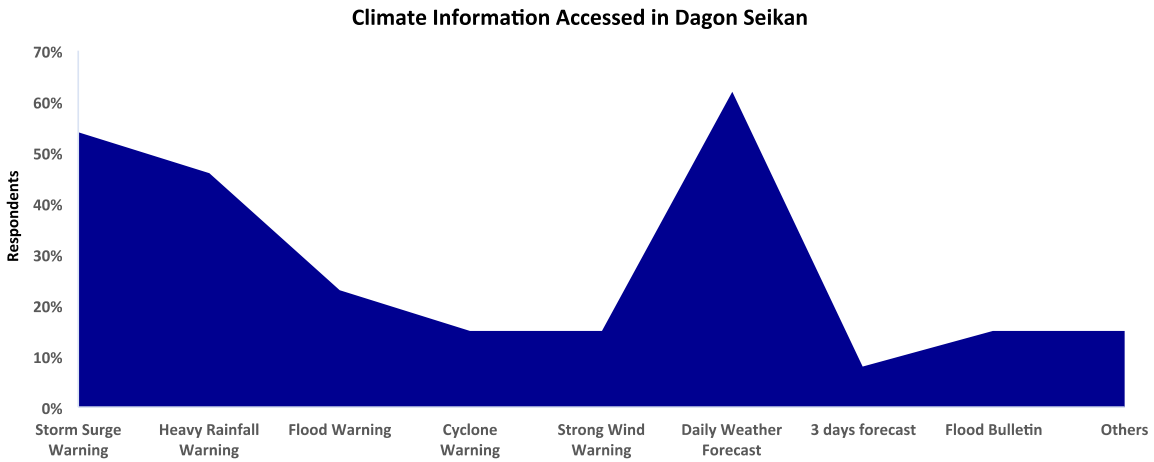

Figure 4. Climate information accessed by TDMC respondents in Dagon Seikan Township. Information accessed is limited to short-range forecasts and warnings

82% of respondents indicated that DMH is their main source of climate information; other information source is mainly GAD and informal/unofficial entities. The main channel for accessing information is television; other sources are social media, phone, SMS, internet, newspaper and radio (in Figure 5).

In Dagon Seikan's TDMC, perception is high that forecasts are easy to understand; about 80% of respondents indicated the same. Validation[1] of this capacity, however, suggests that only 31% of

[1] *Validation of capacity of TDMC to understand forecasts was undertaken by asking respondents to provide their understanding of forecasts and forecast terminologies as used by DMH. Testing of respondents' understanding of forecasts/forecast terminologies included those pertaining to short-range forecast (e.g. heavy isolated rainfall in particular regions) and long-range/extended forecast (e.g. normal, above normal, below normal rainfall in particular regions during the Southwest Monsoon/wet season).*

respondents could understand forecasts/warnings to some degree. Among the respondents, the official who was trained on forecast translation and application, as part of BRACED, recognize that forecasts are not as easy to understand per his assumption prior to the training. His exposure to the training enabled him to be abreast with the different climate information products from DMH, that uses various terminologies that could not be easily understood by stakeholders without being exposed to awareness programs, trainings, and other related activities.

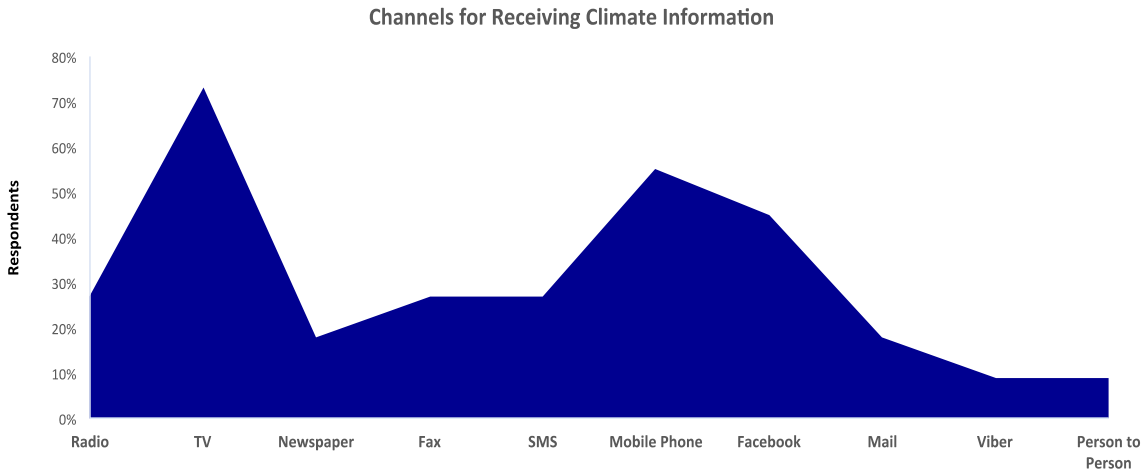

Figure 5. Key channels identified by the TDMC in Dagon Seikan Township for receiving climate information.

With some understanding of forecasts, 73% of respondents articulated that they have some comprehension of the implications of warnings (heavy rainfall, strong wind warning, and flood information), and found the same useful. Key responses/actions, after receipt of information, are focused on dissemination of warnings, evacuation, and preparations for rescue. TDMC and sectoral staff meetings are usually conducted prior to undertaking of key responses/actions. It should be noted that sectoral institutions usually receive orders/instructions from their Regional/District Offices on actions that should be undertaken per warnings, most particularly on flood. Further, most of the actions are undertaken post-hazard, to (partly or fully) address requirements after damages.

Most of respondents from TDMC (55%) disseminate information as received from source; only 36% of respondents indicated that they are disseminating warnings together with suggestions or advisories for sectoral stakeholders and communities. In disseminating warnings, most respondents from TDMC – which also comprise of sectoral institutions – use mobile phone, SMS, and internet-based platforms like Viber. The Information and Public Relations Department (IPRD), in Dagon Seikan, disseminates information but only through notice board in the vicinity of its office. A mechanism for confirmation of receipt of warnings (acknowledgement of receipt by sending a message to the person who shared information), by recipients, has been indicated by TDMC respondents. While there is acknowledgement that there has to be improvements in information dissemination, TDMC members in Dagon Seikan also recognize that available facilities in the township for disseminating information is better compared to that of other townships.

82% of TDMC respondents indicated that they apply and find DMH-generated information useful; this information, however, is only limited to warnings. There is recognition, in TDMC respondents that initiatives for addressing gaps in climate information availability and application, including

those from BRACED, are on-going in the township. These initiatives are recognized as important, with articulation of further capacity building initiatives required.

On provision of feedback to DMH, 82% of respondents indicated that there is no feedback mechanism. Except for those who were able to participate in the Regional Monsoon Forums/Sub-National trainings where they were able to articulate feedback to DMH, there are no other mechanisms existing in Dagon Seikan Township, for facilitating feedback.

2.2.1.b Current Mechanisms of Climate Information Receipt, Understanding, Analysis and Application in VDMCs

Dalaban Village

Respondents from Dalaban Village confirm flood as a primary climate hazard in their community, with recurrence of at least once yearly. As with other areas adjacent to Ayeyarwady Region, Dalaban Village was affected by Cyclone Nargis; there was agreement among the respondents that Cyclone Nargis (which also resulted to flood) was the worst hazard experienced in the community, destroying over 100 houses. Due to the infrequency of the occurrence of severe cyclonic storms, however, community members put more priority to floods.

100% of respondents confirm access to climate information from both DMH and other sources, for guiding their livelihood activities. Climate information accessed by respondents are confined to daily forecasts and warnings (flood warning, storm surge warning), with some respondents indicating that they listen to daily and 10 days weather forecast. The main channel for accessing climate information is television, followed by radio, newspaper, mobile phone and Facebook. It has to be noted that this access to climate information is often disrupted by power interruptions in the community.

As with the TDMC stakeholders, perception is high among respondents (about 60%) in Dalaban Village on their understanding of forecasts; validation of is indicative that full understanding of forecasts (even short-range) is not established in key stakeholders in the village. 40% of respondents articulated that forecasts are difficult to understand.

With limited understanding of forecasts, key response options undertaken in communities upon receipt of warnings are preparation of emergency kits and evacuation. With regular flood events, stakeholders learnt from their experiences and undertake activities for strengthening dikes with sand bags to mitigate floods and their impacts; further, per community experiences, respondents anticipate harmful/poisonous animals during/post-floods. Dalaban Village respondents indicated that they find warnings useful once applied, building on their experiences which are confined to applying warnings.

Among respondents, 60% indicated that they disseminate warnings as received from source, with the main channel for information dissemination being mobile phones (for community focal points) and loud speaker (for the general public). Provision of feedback, vis-à-vis receipt, understanding, and application of warnings, is highly limited. Reporting to GAD is focused on impacts/damages that need to be addressed.

Tha Yet Pin Chaung Village

Respondents confirmed flood as a primary hazard in the village, occurring at a minimum of twice annually. Other key hazards, as prioritized by respondents, are cyclones (Cyclone Nargis was identified as the worst hazard experienced, with destruction of more than 100 houses and damages to power facilities) and coastal inundation.

All respondents confirm access to climate information from various sources (i.e. main source is DMH and GAD; unofficial/informal source is also accessed). Climate information referred to in the community is generally warnings; attention to forecasts, in the absence of potential risks, is almost nil. Main channels for receiving information by respondents, are radio and television; some respondents access climate information via Facebook.

None of respondents in Tha Yet Pin Chaung Village indicated that forecasts are easy to understand. 60% of the respondents felt that they need assistance to understand forecasts; 40% of respondents were of the opinion that forecasts are difficult to understand.

Anticipation of warnings-based potential impacts is not consciously undertaken by respondents; they largely depend on advises from GAD/Village Administration/VDMC for preparation of emergency kits and evacuation. Triggered by their flood experiences over the years, respondents are used to activities related to reinforcing dikes with sand bags, prior to the flooding season, for hazard mitigation.

60% of village respondents are involved in village-level information dissemination (using loud speakers); information is disseminated as received from source. Feedback mechanism, on receipt, understanding and application of information is not established; reporting to GAD during hazard events is in the context of impacts/damages, for obtaining assistance from higher authorities.

2.2.2 Hpa-An Township

2.2.2.a Current Mechanisms of Climate Information Receipt, Understanding, Analysis and Application in TDMC

All respondents from Hpa-An's TDMC prioritized flood as a major hazard in the township, recognition in Hpa-An that many households (about 1,500) remain in low elevation areas, particularly near Than Lwin River, due to livelihoods; these households are most at-risk from floods.

On the other hand, 13% of respondents mentioned drought as key hazard in the township, mainly due to their experience in 2016 when many wells dried up because of extremely high temperature.

100% of respondents confirmed that they have access to climate information. Climate information accessed by Hpa-An TDMC largely refers to warnings (flood warnings, accessed by 80% of respondents; heavy rainfall warning, accessed by 60% of respondents; storm surge warning, accessed by 47% of respondents; strong wind warning, accessed by 20% of respondents; cyclone warning, accessed by 13% of respondents). Daily weather (40% of respondents) and water level (33% of respondents) forecasts are also accessed, but to a lesser

degree compared to warnings. Longer-lead time forecasts are accessed less by respondents from TDMC of Hpa-An. Details are provided for in Figure 6.

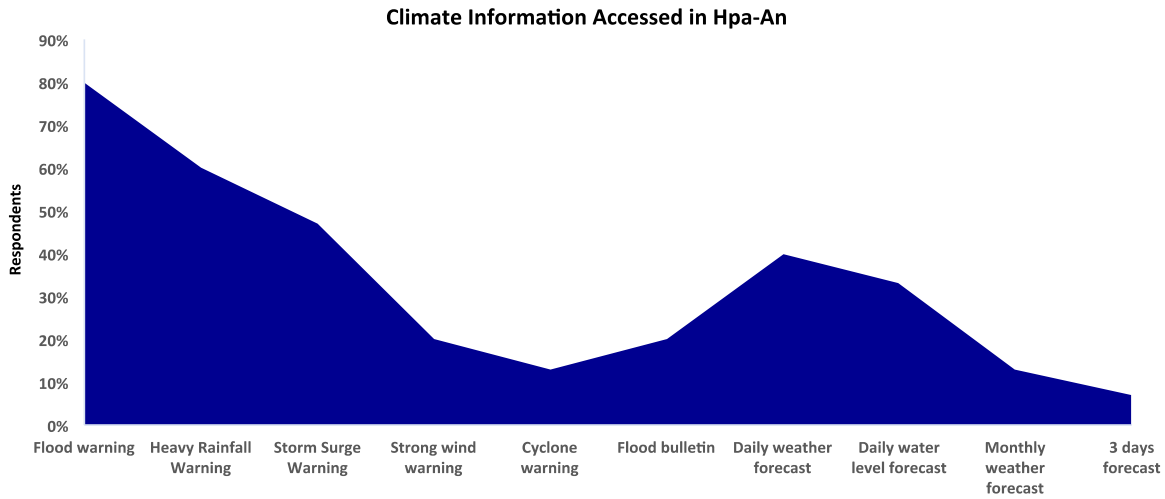

Figure 6. Climate information accessed by respondents from TDMC of Hpa-An Township. Information accessed are largely warnings, followed by daily weather and water level forecasts; longer-lead time forecasts are accessed less.

In general, 33% of respondents access warning information only; 67% of respondents receives/accesses both warnings and forecasts. Longest lead time information accessed is monthly forecast. Climate change projections are not accessed by any of the respondents.

93% of respondents indicated DMH as their main information source. Other sources of information include GAD, RRD and informal/unofficial entities. Sectoral department representatives indicated that the main channel for receiving warnings/forecasts are fax and mobile phone, complemented with television and radio. Other channels for receiving/accessing climate information are Facebook, Viber, person-to-person communication, newspaper, mail, SMS, and mobile application (in Figure 7).

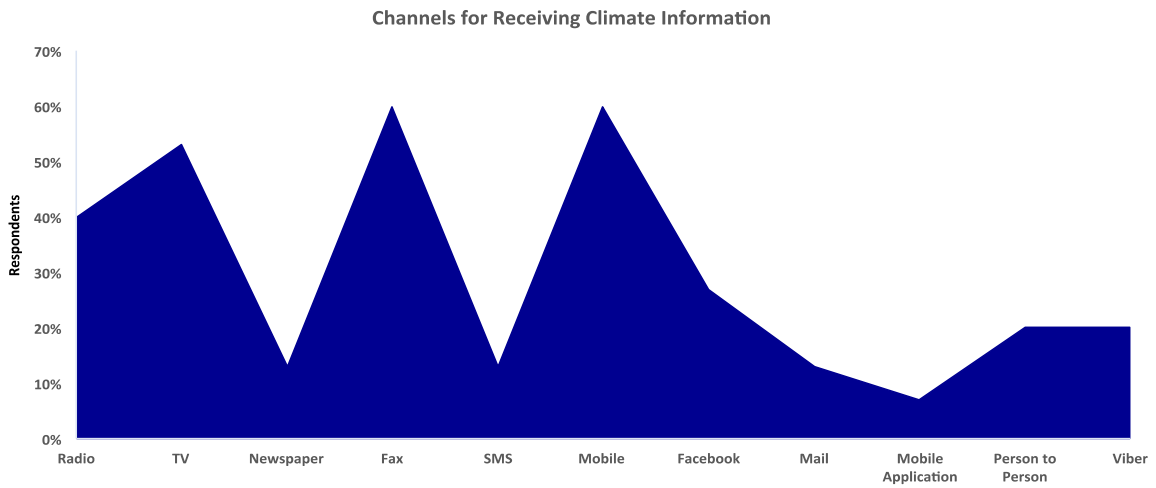

Figure 7. Key channels for receiving climate information among respondents from Hpa-An TDMC are fax and mobile phone, followed by television and radio; other channels are internet platforms like Facebook and Viber; person-to-person communication, newspaper, mail, SMS, and mobile application are also used.

Perception of respondents is high that they understand forecasts/warnings; 80% of them indicated that forecasts/warnings are easy to understand. Validation of their understanding of forecasts/warnings, on the other hand, suggests that full understanding of forecasts is not yet imbedded in respondents. Those who underwent BRACED-supported training on forecast translation and application (53% of respondents) showed significant understanding of forecasts compared to others in TDMC; 20% of respondents indicated that forecasts are difficult to understand and that they need assistance be able to understand the same.

87% of respondents articulated that they can anticipate potential impacts, based on warnings (particularly flood warnings), and they find this useful for developing response options/actions as they expect hazard events. By response options, respondents refer to the following actions, which are generally undertaken per orders/instructions from their respective regional/district offices.

- dissemination
- preparation of equipment, and other requirements, for rescue
- evacuation of human and livestock population to safe places
- awareness raising for ensuring human and livestock health during emergency
- preparations for damage assessments
- provision of instructions and designation of responsible persons for water level monitoring in rivers, etc.

13% of respondents indicated that they do not practice translating forecasts/warnings into potential impacts outlook, for guiding preparedness measures. Actions are primarily undertaken due to receipt of specific orders from regional/district offices.

Respondents articulated that based on recurrent community experiences on floods, households at-risk who can afford home improvements prefer to undertake long-term preparedness mechanisms like improving/increasing house elevation through stilts.

53% of respondents indicated that they disseminate information as received from source; 40% of respondents indicated that they disseminate warnings, together with advisories. The most common means of TDMC members in coordinating with villages, for onward dissemination of warnings and advisories, are mobile phone and official letter/mail. 50% of respondents affirmed that they receive confirmation from information recipients; this confirmation is only through signing of logbook for receiving official letter/mail.

100% of TDMC respondents believe that community stakeholders have capacity to undertake necessary actions in their own communities. These actions include dissemination of warnings to community members through loud speakers; sharing of warnings/advisories to farmers and fishermen; and preparation of safe shelters and food requirements in anticipation of evacuation.

Key challenges indicated by almost half of respondents, in dissemination of warnings to communities are a) different dialects of minority villages in Hpa-An, b) poor telephone line connection, and c) non-familiarity to mobile phone application by Village Administrators.

Overall, 93% of respondents indicated that they find DMH-generated warnings useful.

In 2012, the TDMC of Hpa-An received warning of heavy rainfall. Upon orders/instructions from regional/district officials, the TDMC assigned staff to monitor the situation in a nearby dam, in order for them to anticipate potential spills and possible dam collapse.

Half of respondents recognize efforts, by various institutions and projects, for enhancing gaps in the end-to-end information generation and application system. Respondents opined that those efforts, including those from BRACED, need to be brought forward and further to sustain capacity building.

87% of respondents indicated that feedback mechanism to DMH remains weak.

2.2.2.b Current Mechanisms of Climate Information Receipt, Understanding, Analysis and Application in VDMC

Kaw Mu Thee Village

100% of respondents affirmed flood as the main hazard in the community that recurrently puts livelihoods (i.e. agriculture, fishing and small trade) and households at-risk; flood occurred in Kaw Mu Thee Village at least once yearly until 2013; thereafter, there was less flood experienced in the village. Cyclone was identified as a key hazard, next to floods; some stakeholders identified hailstorm as another key hazard. Most severe hazards were the flood in 2008, in the aftermath of Cyclone Nargis; and hailstorms in 2012 and 2013.

Climate information (i.e. confined to warnings in Kaw Mu Thee Village) is largely accessed by Myanmar language-speaking population. Only 20% of households in the village have radio; those who are Karen speakers generally do not own radios and/or does not have the habit of listening to radio because of barrier in language. Attention to information is only when there are warnings, due to potential risks; these warnings (in Myanmar language) are translated to Karen dialect by the Village Administrator, for provision to Karen population. The understanding of Karen ethnic minority population of forecasts/warnings remain low, mainly due to infrequency of receiving the information.

All of respondents who are Myanmar language-speakers access warnings (cyclone, flood, and heavy rainfall warnings), mainly from DMH. Other sources of information are GAD and informal/unofficial information providers. For Myanmar language-speaking population, the main channel for receiving warnings is radio; other channels include television, social media, and telephone.

For those accessing climate information, perception is high on their understanding of warnings; about 60% of respondents indicated that forecasts/warnings are easy to understand. Validation, however, does not conform with the respondents' perception; understanding of forecasts/warnings is not yet fully established among respondents. On the other hand, 40% of respondents articulated that forecasts/warnings are difficult to understand.

About 50% of Burmese speaking respondents indicated that flood warnings are useful. Initial capacities in anticipating potential impacts from flood warnings/bulletins have been built, and application of the information for saving properties from flood damages is exercised at some

households. It should be noted that a respondent from Kaw Mu Thee Village have been involved in BRACED-supported capacity building in disaster preparedness.

Warnings received, mainly via radio, are shared by recipients to nearby households; there is no robust information dissemination mechanism in the village. The VDMC requires capacity building, for enabling the community to receive warnings/advisories from GAD, enable further customization of warnings, onward dissemination in communities for everyone-at-risk, and undertaking appropriate preparedness measures.

Yae Paw Thaung Village

Like in other earlier villages, flood is the key hazard identified by all respondents in Yae Paw Thaung Village, occurring therein at least twice yearly; heavy rainfall is identified as a priority hazard by respondents only as it equates to flooding. Strong wind is another key hazard identified by respondents; only 4% of respondents indicated cyclone. Severe floods occurred in 2008 (as secondary hazard to Cyclone Nargis); 2007, 2011 and 2013.

Yae Paw Thaung is home to ethnic Myanmar and Karen population; unlike those in Kaw Mu Thee Village, most of the ethnic Karen population in Yae Paw Thaung can speak Myanmar language well. The village population his so accustomed to recurrent floods that most households own small boats for facilitating water transportation.

100% of respondents confirm access to climate information; these are largely warnings (i.e. strong wind warning, flood warning/bulletin, and heavy rainfall warning) and short-range forecasts. All respondents indicated DMH as their main source of information, accessed via radio; television, mail and social media (i.e. Facebook) are complementary information receipt channels. Village stakeholders recognize the role of local NGOs (i.e. Action Aid Myanmar, AAM) in connecting them to DMH-generated information [2]. Significant number of respondents counterchecks DMH-sourced warnings with those generated by informal/unauthorized information providers.

A key impediment in the utilization of climate information in the village is the interest of community members. Most of village households have radio, but villagers do not pay attention to climate information aired over radio, unless there are warnings. Further, MRTV connectivity to villages is not very robust; communities have clearer reception of information aired over FM radio.

While most of the Karen speaking population in the village also understand Myanmar language; significant number of respondents opined that understanding of the Karen population of the forecast would be better if the same is available in their dialect.

58% of respondents in Yae Paw Thaung Village is of the opinion that forecasts/warnings are difficult to understand; 35% of respondents indicated that they need assistance for understanding forecasts better. The group requiring assistance for understanding warnings opines that BRACED, through AAM, provides assistance in making them understand forecasts/warning better. Only 7% of respondents indicated that they find forecasts/warnings

[2] RIMES ensures receipt of AAM of updated forecasts/warnings from DMH, as part of the BRACED capacity building process; AAM is also involved in RIMES-facilitated capacity building activities in forecast interpretation, translation into impacts outlook and response options, and application.

easy to understand; validation of this suggests, on the other hand, that respondents only have partial understanding of forecasts.

With support for enhancing their understanding of forecasts, some respondents were able to anticipate potential impacts from flood warnings/bulletins and were able to mitigate damages from floods.

Dissemination of warnings received are done, for the most part, through nearby households through person-to-person communication. The understanding of the importance of feedback mechanism is not realized in the community and hence, not established therein.

2.2.3 Keng Tung Township

2.2.3.a Current Mechanisms of Climate Information Receipt, Understanding, Analysis and Application in TDMC

Flood and landslide are identified as key hazards in Keng Tung, albeit recurrence of significant events has been observed less after the 2008 and 2013 severe floods and landslides. Isolated/small floods are recurrently happening in some villages. The 2013 floods and landslides were extremely damaging in the township due to silt/soil that covered about 200 acres of agriculture land, making the practice of agriculture impossible for many farmers for about three (3) years; the changes in the course of Nan Phu river, partly as a result of the extreme flood and drought in 2013, further exacerbated impacts to farmers[3]. Moreover, strong wind is identified as a key climate hazard in Keng Tung; thunderstorm and drought, while identified, were the least priority hazards in the township.

100% of respondents, from Keng Tung's TDMC, indicated that they have access to climate information – these refer to warnings (67% of respondents accessing cyclone warning; 20% are prioritizing access to heavy rainfall warning; 13% of respondents access storm surge and strong wind warnings) and short-range forecast only (47% of respondents convey access to daily forecast). Climate change projections are accessed by 13% of respondents, while 7% of respondents access seasonal forecast. These details are provided in Figure 8.

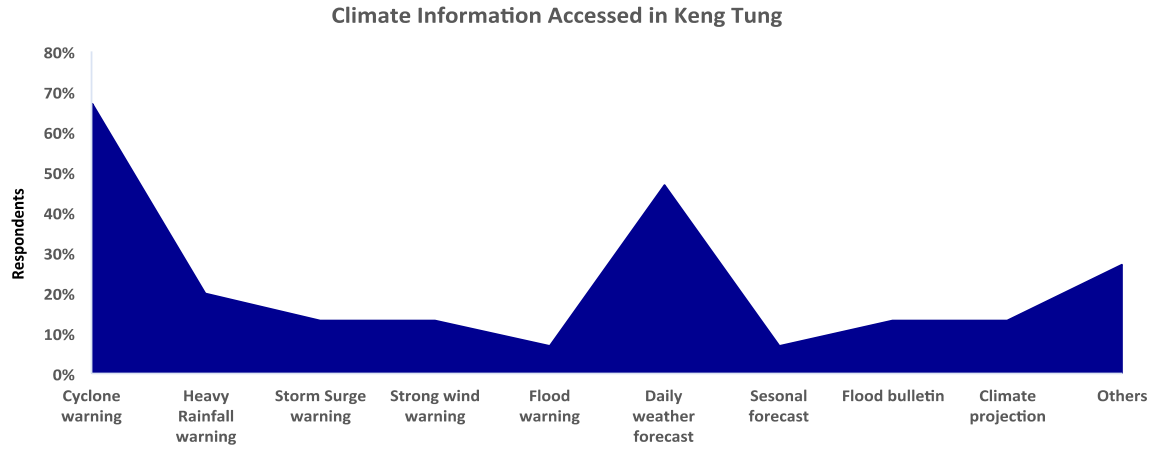

Figure 8. Information accessed by members of TDMC in Keng Tung Township are mainly warnings and short-range forecast. Minimum number of TDMC members access seasonal forecast and climate change projections

[3] *Nan Phu River has been renovated by the Irrigation and Water Resources Utilization and Management Department (IWRUMD).*

In summary, 54% of respondents access solely warnings, 33% of respondents access both warnings and forecasts, while 13% of respondents access daily forecast regularly.

In terms of main information source, 87% of respondents identified DMH; this is followed by GAD, Thai Meteorological Department (TMD), informal/unofficial information provider, and RRD. While DMH remains as the key information source, about 50% of respondents refer to multiple sources of information, to counter-check DMH-generated forecasts/warnings.

Sectoral department representatives access climate information mainly through television, social media (Facebook) and other internet-based platform (website, email); other channels of information are fax, telephone, SMS, newspaper and radio (in Figure 9). 45% of respondents do not rely on Facebook, due to confusion on the official information source. A number of informal/unofficial information provider entities share, over Facebook, their own analysis of potential weather/climate conditions, which at several instances vary from information provided by DMH. Due to responsibility associated with decision-making, stakeholders are cautious with making decisions, and multiple sources providing divergent information often leads to confusion and not making any decision at all on the part of stakeholder sectors.

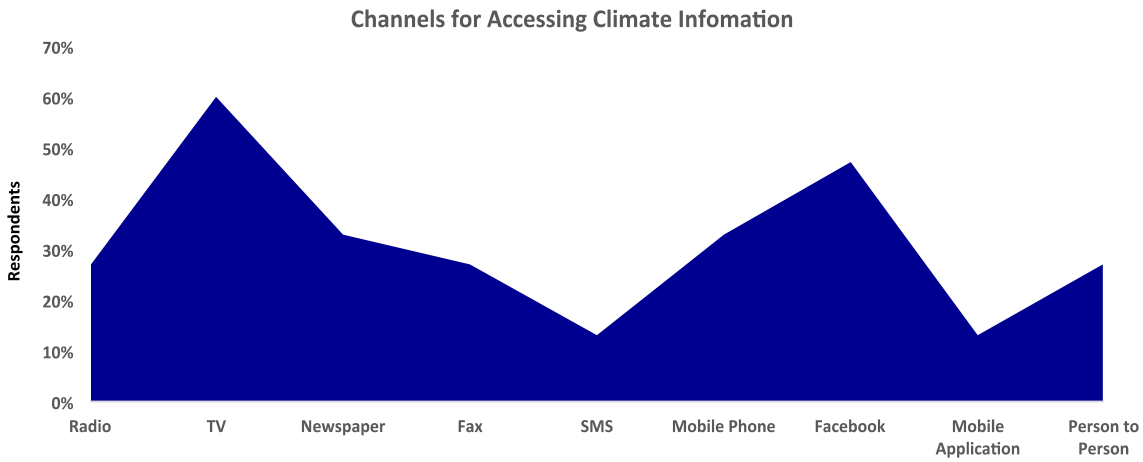

Figure 9. Key channels for accessing climate information in Keng Tung Township. The most popular channel used by TDMC is television, followed b Facebook.

While 60% of respondents perceive that forecasts are easy to understand, validation thereof confirms that forecasts are not understood fully. Some respondents understand terminologies such as *normal*, although this does not come with the anticipation of the potential consequences for various sectors; those who understand forecasts/terminologies had to refer to materials that were provided to them during the BRACED-supported training on forecast translation and application. 40% of respondents find forecasts difficult to understand.

Actions undertaken in the township, based on warnings, are limited to onward dissemination of information, preparations for rescue and provision of recommendations to farmers and livestock owners for preparation for damage assessment.

Forecast translation, into potential impacts outlook and response options, is at a very young stage in Keng Tung, with high reliance of TDMC on higher authorities (i.e. Regional and District Offices), for advises on actions to undertake.

Township stakeholders constructed temporary dike, reinforced with sand bags, along the Nan Kan and Nan Lway Rivers to prevent flooding in Keng Tung, after they received flood warning in August 2012; the advisory for constructing temporary dike came from Regional GAD office. According to respondents, flood was mitigated from the township due to actions undertaken.

47% of respondents disseminate warnings as received from source; on the other hand, 40% of respondents disseminate warnings together with recommendations for department stakeholders and communities. The dissemination of warnings, to Village Administrators, are often done through mobile phone and official letter. Members of TDMC have the perception that information recipients in communities have the capacity to undertaken necessary actions, after receipt of warnings. These actions, albeit, only refer to onward dissemination of early warning information; confirmation of receipt of warnings is largely through log book.

Almost half of TDMC respondents consider language as a key barrier for communities to take interest in, access, and utilize warnings/forecasts – this is particularly relevant in areas where ethnic minorities are located, like in Ah Khar and Lar Hu communities in Keng Tung. Other challenges in the dissemination and utilization of forecasts/warnings are poor telephone connection; poor transportation facilities; financial constraints on the part of end-users who needs resources to undertake decisions like repair of dikes and changing of crops, etc.; and limited time for acting on forecasts/warnings.

87% of respondents indicated application of climate information; this utilization of climate information is limited to warnings and daily forecasts. In Keng Tung, temperature is a key parameter, and respondents regularly check temperature forecast.

Initiatives for addressing gaps, in climate information application, disaster risk reduction, and resilience, including those from BRACED, are acknowledged by respondents. There is also acknowledgement that environmental conditions exacerbate hazard impacts; financial resources are required for effectively undertaking actions especially in poor households and communities; and community interest is key in enhancing access, utilization, and application of forecasts/warnings for disaster risk reduction.

Except for BRACED-supported forecast translation and application training that 20% of respondents was able to participate in, there is no other feedback mechanism established in Keng Tung, for connecting relevant institutions to DMH.

2.2.3.b Current Mechanisms of Climate Information Receipt, Understanding, Analysis and Application in VDMC

Nan Noon Village

Nan Noon Village is located in high-elevation area, and respondents identified rainfall-induced landslide as a primary hazard impacting their village, which is mainly an agrarian community. Other relevant hazards are heavy rainfall, thunderstorm, strong wind, high temperature, and hailstorm. All the mentioned hazards occur annually in Nan Noon Village. The community regards

the hailstorm which occurred in 2016, as one of its most severe hazards; partly because the village is located uphill, impacts of the 2010 earthquake were also considered as among the worst in Nan Noon Village.

Nan Noon Village is home to the following ethnic minorities: Ah Khar, La Hu, Chinese and Shan. The Village Administrator and a few young community members speak Myanmar language; majority of the village population speak ethnic dialects.

Respondents access climate information; due to proximity of the village to Thailand, a key source of information identified was TMD; DMH and GAD, and informal/unofficial information provider are also among the key sources of information for the village. Village respondents highlighted their access to Tha Zin FM, which translates climate information from DMH, GAD and informal/unofficial information provider into ethnic dialects. Main channels for accessing climate information are radio, television, and internet. Climate information being accessed in the village is limited to warnings and daily forecast.

72% of respondents in Nan Noon Village find climate information difficult to understand. The difficulty in understanding forecasts takes root mainly due to mismatch between the dialects used in the village, and the forecast that is generally available in Myanmar language. Due to the issues on forecast access by ethnic dialects-speaking population in the village, they resort to observation of nature and other traditional knowledge (plants and animals and Ah Khar ethnic calendar), as their ancestors used to do.

32% of respondents find forecasts/warnings useful, and they indicate that for farmers, indication of potential rainfall mean they have to undertake actions such as early harvesting. World Vision, as part of BRACED, contributed to this capacity.

Dissemination of warnings in communities is usually done, as received from source, with ingestion of local knowledge and practices. The process of confirmation of receipt of information is not practiced in the community. Community stakeholders feel strongly that awareness activities; trainings; equipment for enhancing dissemination and community connectivity to FM station that uses their dialects; and provision/announcements of warnings/forecasts by late afternoon, when the village population is back from work, are highly necessary. Feedback mechanism is existing in the community.

Nar Par Khar Village

Drought is considered a key hazard in the village, and is experienced on an annual basis; strong wind follows, also occurring annually; heavy rainfall, flood, landslide, and hailstorm are other priority hazards in the community. The hailstorm of 2016 destroyed roofs of many houses, and is considered one of the worst events in the village. Nar Par Khar is home to another ethnic group, La Hu, and located in the highland.

The village population access TMD (ethnic population can understand Thai due to their proximity to Thai villages); Tha Zin FM is also accessed where information is provided in La Hu ethnic dialect; Myanmar-speaking population of the community refer to GAD and informal/unofficial information provider entity, as their information sources. Community members mainly access warnings. The main channels for accessing climate information are radio and television.

Village administrator/VDMC Members announce warnings via loudspeaker in the community. All respondents indicated that they find warnings difficult to understand, mainly due to use of ethnic dialect in the area, let alone familiarity with forecast language. Due to difficulty in understanding warnings, many community members continue the culture of observing the environment for "anticipating" future weather/climate events.

Efforts at enhancing community capacity, based on hazard experiences, include renovation/improvements in roofing of houses and enhancing the sub-center of the fire brigade station in the community, to be able to respond better to community requirements. 10% of respondents indicated that BRACED-facilitated capacity building (through WV) was able to assist them in undertaking relevant preparedness activities.

There is no mechanism for confirmation of receipt of warnings and provision of feedback.

2.2.4 Kyauk Phyu

2.2.4.a Current Mechanisms of Climate Information Receipt, Understanding, Analysis and Application in TDMC

All respondents find cyclones/storms, and secondary hazards (strong wind, heavy rainfall and flood), as key hazards in the township, recurring on an annual basis. The most severe cyclone experienced in Kyauk Phyu was Giri, in 2010.

100% of TDMC respondents in Kyauk Phyu confirmed that they access climate information. Unlike in other townships that mainly utilize warnings only, 65% of the respondents in Kyauk Phyu access both forecasts and warnings; forecasts, though, refer mainly to daily forecast. 29% of respondents access warning information only; while 6% of the respondents access forecast information only.

Storm surge warnings are most accessed (76% of respondents), followed by daily weather forecast (71% of respondents). Other information accessed are heavy rainfall warnings (41% of respondents), cyclone warnings (41% of respondents), and strong wind warnings (24% of respondents). 6% of respondents access flood warnings, scanty rainfall warnings, flood bulletins and monthly forecast. Figure 10 provides this information.

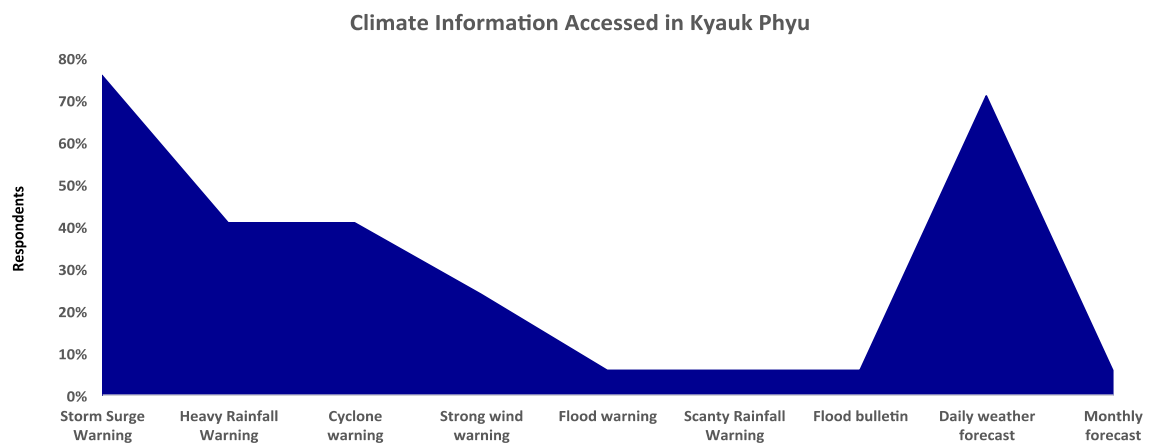

Figure 10. Climate information accessed by TDMC members in Kyauk Phyu are mainly warnings and daily weather forecast. Access to longer lead time forecast is minimal.

88% of respondents rely on DMH as the main climate information source; other information sources include GAD, RRD, and informal/unofficial information entity. Key channels for accessing information are mobile phone, radio, social media (Facebook); these are complemented with newspaper, fax, Viber, SMS, and others, in Figure 11.

As with the other township TDMCs, perception is high in Kyauk Phyu that forecasts/warnings are well understood. 65% of respondents perceive that warnings/forecasts are easy to understand; validation of this suggests that full understanding of warnings/forecast is not yet established in most of stakeholders in Kyauk Pyu. Moreover, 35% of stakeholders find forecasts/warnings difficult to understand and require assistance to facilitate understanding of the same.

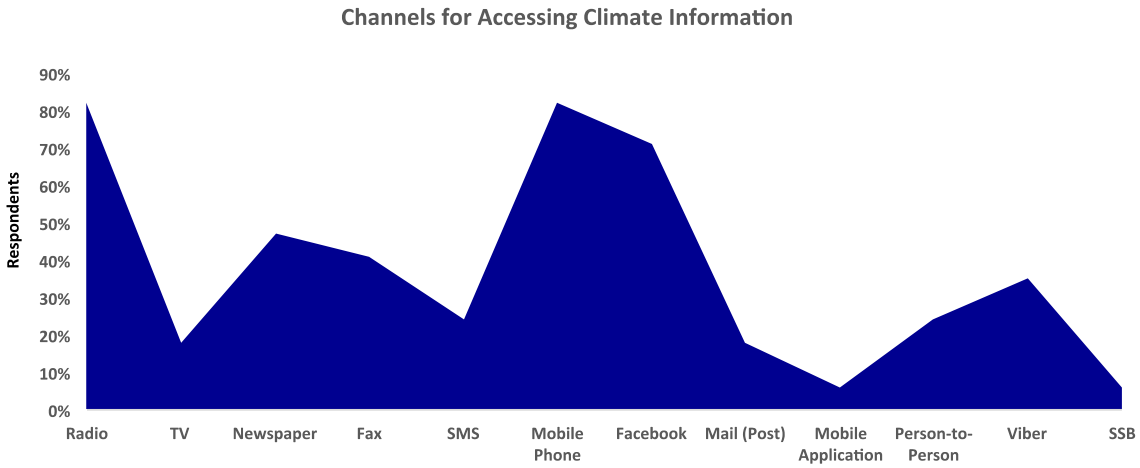

Figure 11. Key channels for accessing climate information in Kyauk Phyu. Most respondents prefer to use radio, mobile phone and Facebook

Actions being undertaken in the township, by various sectors, are guided by orders/instructions received from regional/district offices. These actions include preparations for rescue and emergency response; onward dissemination of early warning information, particularly cyclone warning coded as "red"; preparations for evacuation; and observation of water level in relevant areas, among others. In the TDMC, 94% of respondents believe that they can anticipate potential impacts based on warnings (mainly cyclone warnings).

35% of respondents disseminate warning as received from source; almost 60% of respondents disseminate warnings with suggestions/advisories for department stakeholders and communities (i.e. Department of Public Health (DOPH) informs Rural Health Centers (RHCs) of warnings and provides suggestions/advisories on necessary actions). Most sectoral departments convey information to Village Administrators and Village DRR Committees by mobile phone, SMS, and Viber groups.

The TDMC believes that recipients have capacity to undertake necessary preparedness, based on warnings. These preparedness actions include onward dissemination of early warning through loud speakers in communities; provision of advisories to farmers and fishermen; observation/monitoring of water level in relevant areas; and preparation of sand bags and stones for reinforcing dikes. The mechanism of confirmation of receipt of warnings, by recipients, is not in place. Key challenges identified in further dissemination and believability of information is poor communication channel and multiple information sources available via various channels

that lead to confusion, respectively; a key challenge in full-scale preparedness is the interest of community members in responding to warnings.

> In communities, people do not pay attention unless the wind speed is expected within 80-100 mph. During Cyclone Giri (2010), some communities did not give attention to warnings as the wind speed was expected only to be within 50-70mph. As a result, impacts to communities were not anticipated and damages were recorded.

88% of respondents find DMH-generated warnings useful, while acknowledging that there are still gaps. There is recognition by about 50% of TDMC members of the initiatives implemented for addressing gaps in the end-to-end information generation and application system, for enhancing DRR and resilience, including those from BRACED. In Kyauk Phyu, it is also recognized that the enhancements in basic facilities, like electricity, will improve access, understanding and utilization of forecasts/warnings.

94% of stakeholders conveyed that feedback mechanism, to DMH, is not in place in the township, except for trainings and Monsoon Forums conducted by DMH, RIMES, and UN-Habitat, as part of BRACED.

2.2.4.b Current Mechanisms of Climate Information Receipt, Understanding, Analysis and Application in VDMC

Leik Tin Village

Village respondents agree that cyclones, coastal flooding and heavy rainfall are the key recurrent hazards in the community; Giri was considered as the worst hazard experienced in the community. Cyclones/storms, and secondary hazards, are experienced on an annual basis.

The community is used to evacuation, being mostly exposed to cyclones and associated hazards. VDMC members provide alerts/alarms to community members, for guiding evacuation of at-risk population.

Access to information is regularly conducted by community members, as they feel that this is highly important for their livelihoods. Most of the community members refer to information from GAD, but they also refer to informal/unofficial information sources.

The community access mainly warnings (cyclone and storm surge warnings); forecasts, in the absence of severe weather conditions, are generally not accessed. Key channels for accessing warnings are radio, television, mobile phone, person-to-person communication, and Viber.

Most community members rely heavily on instructions from GAD vis-à-vis preparedness relevant to hazards/warnings. Referencing to informal/unofficial source of information is also high, particularly due to easy access to internet-based platforms, particularly Facebook; community members feel that they are able to obtain required warning details (i.e. cyclone track, potential impacts, and advises) from informal/unofficial climate information source.

Respondents find forecast difficult to understand; the community, however, acknowledges various institutions/development organizations, and local NGOs which are providing them assistance in understanding warning, and to some extent, in apply them in community decisions.

In responding to warnings, the community refers to its standard operating procedures (SOPs), which are upheld by GAD, and which mainly includes assignment of tasks to VDMC members, DRR group, evacuation processes, preparation of emergency kits, and others related.

Key channel for dissemination of warnings is through loudspeaker; warnings disseminated are complemented with evacuation advisories, and other related instructions. Confirmation of receipt of warnings by community members is not practiced; community members are of the opinion that the dissemination of warnings/advisories is not a key challenge in the community as loudspeakers reach local stakeholders. Feedback mechanism, linking the community to higher authorities (including DMH), on the receipt, understanding, analysis, and application of warnings, is not in place.

A key concern of the community is the capacity building of its constituents in using climate information of different lead times, for better risks and resources management. Due to significant fishermen population, the community strongly articulated that fishermen should be among the target groups in the capacity building.

Wa Myaung Village

Like other villages in Kyauk Phyu, Wa Myaung is exposed to cyclones/storms and secondary hazards like heavy rainfall, strong wind, coastal flooding and landslide. Cyclones/storms is experienced at least twice annually. River bank erosion was cited by the community as aggravating hazard impacts. Cyclone Giri is considered the worst hazard experienced in the community. Wa Myaung is home to mostly ethnic Rakhine population.

Most of community stakeholders are accessing warnings and weather forecasts (cyclone, storm surge, strong wind warnings; daily forecast), sourced from DMH, GAD, and also from informal/unofficial information provider entitiy. Key channels for accessing information are radio, television, and mobile phone; for those with internet connectivity, Facebook and Viber are popular channel sfor receiving warnings, from higher authorities.

While perception is high in the community on their understanding of warnings/forecasts, this understanding is partial at best. Responses to warnings (particularly cyclone warnings) are highly confined to those included in the community's SOP, viz. assignment of tasks to VDMC members and DRR group, evacuation procedures, and preparation of emergency kits.

Communities recognize the role of local NGOs in capacity building in DRR/resilience. Community members opine that reforestation, maintenance/improvements/protection of river bank structures, and ensuring better power facilities (to receive forecast regularly), would assist them in enhancing DRR.

The community disseminates warnings, complemented with advisories, via loudspeaker. Confirmation of receipt of warnings is not a practice; the community is of the opinion that dissemination of warnings is relatively easy, due to availability of loudspeakers that enable VDMC members to disseminate warnings to most parts of the village. Feedback mechanism, for

interacting with DMH and providing experience-based recommendations is not existing. Feedback is provided to, and remains, with the Village Administrator.

2.2.5 Labutta Township

2.2.5.a Current Mechanisms of Climate Information Receipt, Understanding, Analysis and Application in TDMC

In Labutta, almost all of the respondents (92%) prioritized cyclones/storms, and their secondary hazards (i.e. heavy rainfall, flood and strong wind), recurring at least once annually). 46% of respondents further indicated that Labutta is also prone to water scarcity and fire, particularly during the dry season. The worst hazard experienced in the township was Cyclone Nargis, in 2008.

100% of respondents from Labutta's TDMC confirms access to climate information, with recognition that the information is important for livelihoods. Climate information referred to by respondents, however, is limited to warnings (cyclone, flood and heavy rainfall warnings). 8% of respondents are aware of 3 days, monthly and seasonal forecast; 23% access 10 days forecast; while 46% of respondents listens to daily weather forecast. These details are supplied in Figure 12.

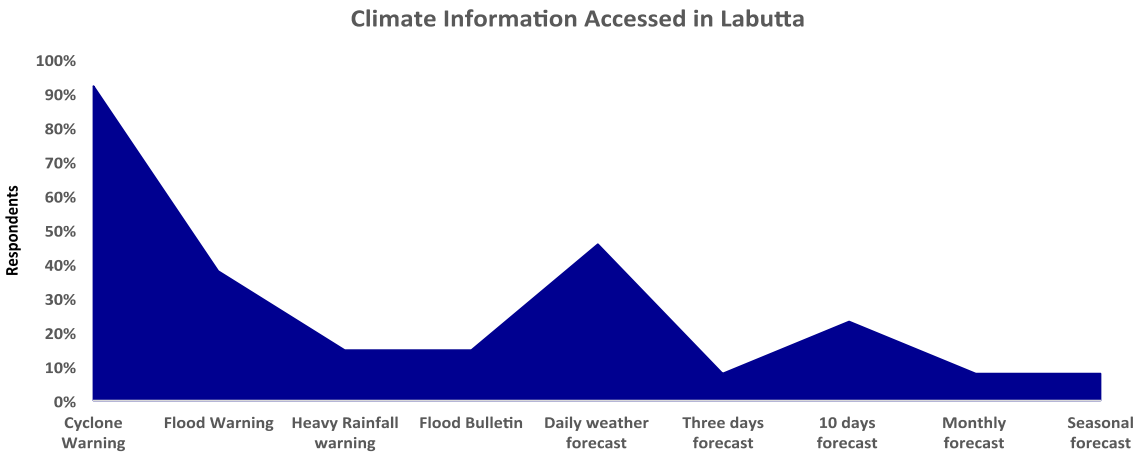

Figure 12. Information accessed by TDMC in Labutta. Information accessed are mainly warnings; lesser number of stakeholders access daily, 10 days, monthly and seasonal forecasts.

In general, 62% of respondents accesses both warnings and forecasts; while 38% of respondents accesses warnings only.

In identifying the information source, 69% of respondents rely on DMH-generated climate information, but also counter-checks with information/orders/instructions from GAD/RRD/district/regional department offices; as well as with forecasts from informal/unofficial sources. Access to informal/unofficial sources of information was preferred by around 31% of the respondents as they feel that they can obtain more details, and information is more comprehensive and timely.

Key channels used for accessing climate information are radio and television (86% of respondents each), person-to-person communication (57% of respondents), mobile phone (29% of respondents, Facebook (29% of respondents) and Viber (14% of respondents), in Figure 13.

In Labutta, there is recognition that forecasts are not that easy to understand; 15% indicated that forecasts are easy to understand, although there is a requirement for them to refer to the list of terminologies and definitions provided to them during the BRACED-facilitated training on forecast translation and application. 54% of respondents finds forecasts difficult to understand; and 31% of respondents needs assistance for better understanding of the same.

On anticipating potential impacts from warnings and undertaking responses, 77% of respondents conveyed that they have experienced doing so, although this exercise is focused on warnings only (particularly cyclone warnings). Key preparedness actions undertaken were focused on evacuation, preparations of medical bags, and provision of orders for ferries and fishing vessels from going to sea. 23% of respondents do not practice analysis of forecast for anticipating potential impacts and in guiding preparedness actions. It should be noted that many township decisions are undertaken with guidance from district and regional officials of relevant offices.

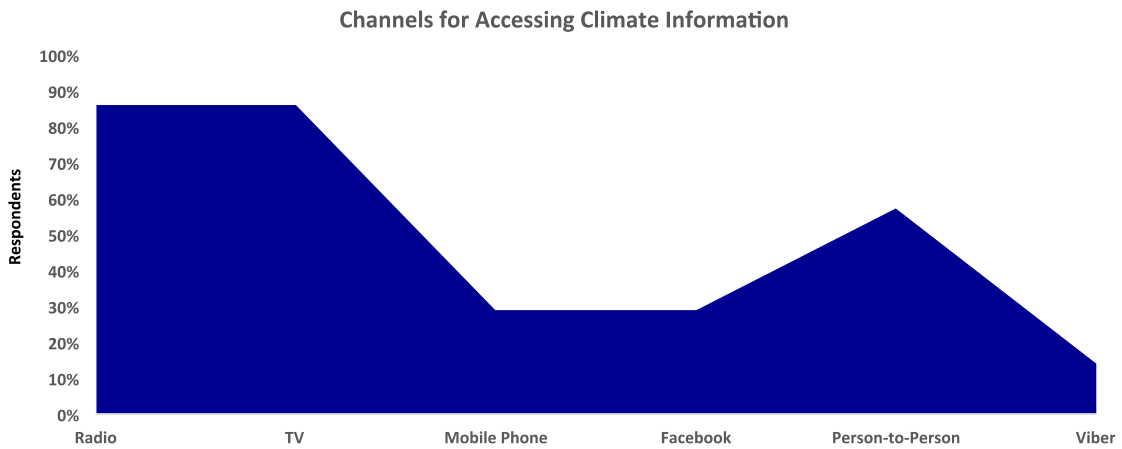

Figure 13. Channels used for accessing climate information in Labutta Township

82% of respondents disseminate warnings as received from source; respondents believe that warning recipients in communities have capacity to undertake required actions. Only 18% of respondents provide advisories to department stakeholders and communities, as an outcome of their learning from their experiences and BRACED-facilitated training on forecast translation and application. Mechanism for confirming feedback from recipients is in place, as indicated by about 50% of respondents; this is generally done through provision of community-observed updates to GAD, via mobile phone. 36% of respondents find difficulty in dissemination of warnings mainly due to poor mobile and internet connection.

Application of information is highly limited to warnings only, with guidance received from higher offices on decisions that would be undertaken.

In October 2016, in anticipation of the impacts of Cyclone Kyant, the TDMC of Labutta undertook a decision for a preemptive mass evacuation, for ensuring safety of those at risk. Most respondents, however, feel that such decision has to be reviewed in order to undertake more careful decisions. Cyclone warning coded "red" is generally regarded as dangerous, without further consideration of the size and strength of the cyclone. Better decisions, thus, can be undertaken when the warning is analyzed from all angles, and diminish panic among the population, noting the tragic memory of the population relevant the impacts of Cyclone Nargis in 2008.

All respondents recognize efforts from various institutions and projects, for addressing gaps in forecast interpretation, translation and application. In particular, efforts by DMH, RIMES, UN-Habitat and AAM (as part of BRACED), are well recognized as feeding into their capacity building requirements for better understanding and utilization of forecasts.
Those who participated in BRACED-facilitated trainings and Monsoon Forums confirm that they can provide feedback to DMH; there are no other feedback mechanism aside from these.

2.2.5.b Current Mechanisms of Climate Information Receipt, Understanding, Analysis and Application in VDMC

Aung Hlaing Village

Priority hazards, as identified by stakeholders include cyclone/storm, heavy rainfall, strong wind, coastal flooding, storm surge, with cyclone/storm as key recurrent hazard in the community. Cyclone/storms are experienced at least twice annually in the community. Worst hazard experienced was Cyclone Nargis.

All respondents indicated that they have access to climate information, albeit intermittently. The community accesses information from multiple sources: most of the respondents indicated access of information from DMH, which is also counterchecked with information disseminated by GAD and informal/unofficial information source. Information accessed are mostly warnings and daily forecast; there is some limited access to monthly forecast.

The community access warnings mainly through radio (AM and FM; more than 50% of respondents), television; mobile phone and inter-based platforms play key roles, despite connectivity still being challenged due to distance of the community from the township, and the density of the mobile phone and internet connectivity facilities across the country, particularly in the delta.

85% of respondents find warnings/forecasts difficult to understand; those who were trained in BRACED-facilitated forecast translation and application trainings have shown skill in understanding warnings and forecasts (including associated terminologies). Although still largely accessing short-range information, those who were trained understand the availability of longer-lead time forecasts, through various channels. There remains a requirement, though, for further capacity building to enable them to fully understand and utilize longer-range information.

About half of respondents are accessing warnings only; the other half is accessing both warnings and forecast. Those with difficulty in understanding forecasts/warnings often resort to observing the environment for indications of weather/climate ahead.

Precautionary/anticipatory measures undertaken in Aung Hlaing village, upon receipt of cyclone warnings, is to restrict fishing and water transportation vessels from operating. This capacity has been built post-Nargis, and has been practiced by the VDMC. Various capacity building activities, by various NGOs, development organizations (including BRACED), for supporting the government, also contributed to this process.

Based on the community's recurrent experience vis-à-vis impacts from storms and cyclones, community members constructed a small-scale structural mitigation infrastructure, made of sand bags, for mitigating direct impacts of storm surge. River bank erosion contributes to exacerbating hazard impacts and the community put in efforts for river bank protection.

In cases of cyclone warnings, community members undertake evacuation protocols based on community SOPs; VDMC members alert the public in cases where evacuation is required. Restrictions for fishing and water transportation vessels are issued in cases of cyclone warnings.

26% of respondents indicated that they disseminate warnings with advisories; generally, this pertains only to warnings. In the "absence" of a potential threat, access and dissemination of forecasts goes down when there is no severe weather anticipated. Reporting mechanisms, of locally observed conditions by community focal points to VDMC, also provide opportunities for confirmation of warning.

Feedback mechanism, connecting the community DMH, is firmly established.

Tharyar Gone Village

Community respondents prioritized coastal flooding, thunderstorms, and water scarcity as key recurrent hazards in the community. River bank erosion contributes to their vulnerability, exposing wider area and more community members to the hazard and its impacts. Nargis, in 2008, was the worst hazard experienced in the community.

Respondents receive DMH-generated information, and are being counter-checked with information from GAD and informal/unofficial source; information accessed are mostly warnings (mostly cyclone warnings) and daily weather forecast. Key channels for accessing climate information are radio, television and internet-based platforms, particularly Facebook and Viber.

Village stakeholders find climate information difficult to understand. The difficulty in understanding forecasts resulted to reliance of community members on the use of observation vis-à-vis elements of the environment as "indicators" of potential weather/climate ahead.

In dissemination of warnings to community members, VDMCs provide advisories. Response to cyclone warnings are basically anchored on the community SOP, similar to that adopted by other communities. In Tharyar Gone, significant village population is involved in fishing and water transportation endeavors. Precautionary/anticipatory measure undertaken in Tharyar Gone village, upon receipt of cyclone warnings, is to restrict fishing and water transportation vessels from operating. This capacity has been built post-Nargis, and has been practiced by the VDMC.

In terms of water deficit, the main coping mechanism is getting drinking water from nearby villages; this is done when there are already impacts of water scarcity in the village.

Various VDMC focal points in the community provide updates on locally-observed conditions, to the VDMC, and this also serves as the main confirmation mechanism for warnings. This process, however, is restricted by the quality of mobile phone and internet connectivity in the community. Due to distance from the township, mobile phone and internet connectivity remain challenged (although improvements have been tremendous in previous years). Feedback mechanism is not well established in the community.

2.2.6. Mawlamyine

2.2.6.a Current Mechanisms of Climate Information Receipt, Understanding, Analysis and Application in TDMC

Cyclones/storms and cyclone/storm-induced strong wind and heavy rainfall are identified as among key recurrent hazards in Mawlamyine. Flood, however, is the hazard most prioritized by respondents (83%), due to its high recurrence rate of once or twice annually, on the average. The most severe hazards observed were Cyclone Nargis in 2008, and floods in 2013 and 2017.

In Mawlamyine, community-based organizations (CBOs) are highly recognized as essential for improving DRR and resilience. Other factors considered as highly important in enhanced DRR and resilience are renovation of roads and water flow canals, and improvements in agriculture technology by mechanization and other interventions. The IWRUMD is also recognized for its efforts in regularly checking dam conditions and implementation of necessary maintenance.

100% of respondents access climate information – this climate information is very confined to warnings and daily weather forecast, with limited number of respondents accessing 10 days, 3 days, monthly and seasonal forecasts, in Figure 14.

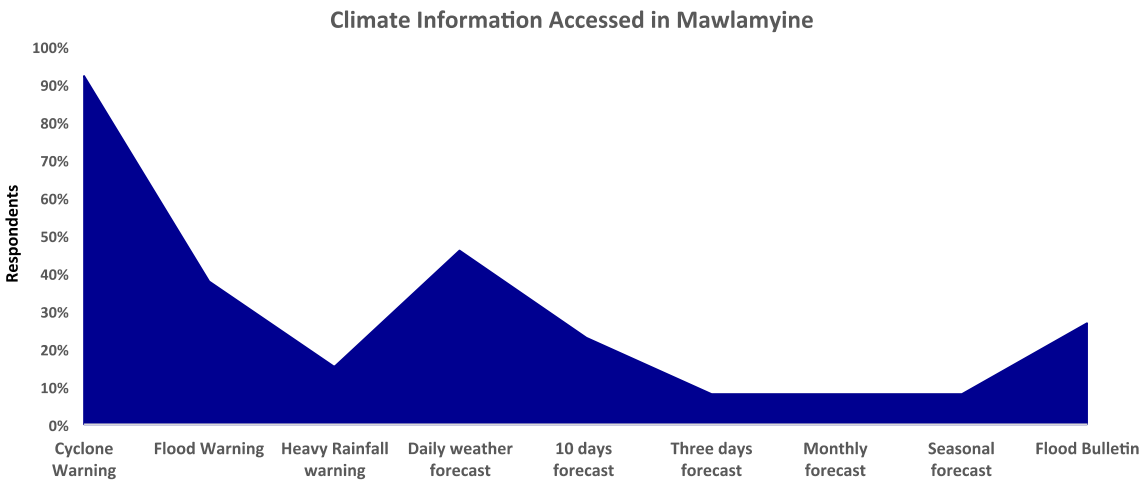

Figure 14. Climate information accessed by respondents from TDMC in Mawlamyine. Climate information accessed is concentrated on warnings and daily forecast.

In general, 61% of respondents access a combination of forecasts and warnings; 28% of respondents access warnings only; while 11% of respondents are accessing forecasts only. In terms of climate information source, 94% of respondents source their information mainly from DMH, which is being counter-checked with other sources such as GAD, RRD, and informal/unofficial source. 6% of respondents highly depend on advise from GAD.

Respondents indicated that their main channels for accessing climate information are radio, television, person-to-person communication, Facebook, mobile phone, newspaper, and mail. This information is elaborated in Figure 15.

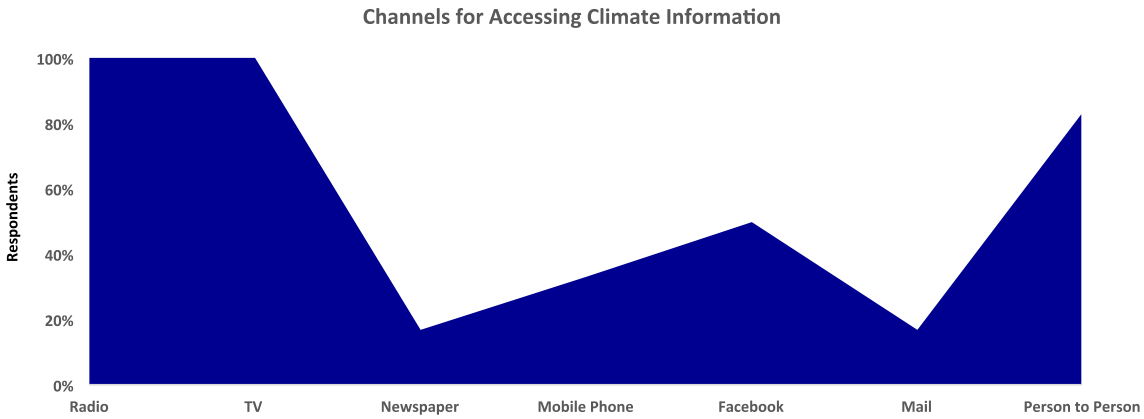

Figure 15. Channels for accessing climate information in Mawlamyine; radio and television has the highest usage, followed by person-to-person communication, Facebook, and mobile phone.

Although there is strong perception that climate information is easy to understand (i.e. 70% of respondents conveyed they find forecasts/warnings easy to understand), validation of respondents' understanding of climate information suggests that full understanding of the same is yet to take place. There is, though, certain level of understanding in respondents. For respondents who participated in the BRACED-facilitated township-level training on forecast translation and application, there is acknowledgement that forecasts are not easy to understand, as they were exposed to various terminologies used in different lead times of information; they refer to the list of terminologies and definitions provided to them during the training, for understanding forecasts. 22% of respondents find forecasts/warnings difficult to understand.

78% of respondents have experience in anticipating potential impacts, based on warnings (cyclone and flood warnings), and undertaking measures to mitigate potential impacts, based on orders from regional/district offices. Key responses to information include onward dissemination of warnings, and preparations for both human and livestock rescue. Up until this time, most of activities in the township is still focused on post-hazard response, in many institutions.

Department of Fisheries (DOF) issues warnings to fishermen and fishpond operators, highlighting potential risks, and suggesting actions for safety and mitigation of potential impacts. These actions are also guided by orders from district/regional offices.

Key challenges identified in undertaking effective responses to warnings are a) limited lead time in warnings, b) insufficient coordination between government departments, c) inattention of

community stakeholders to forecast and warnings, and d) insufficient communication devices, particularly for off-shore stakeholders.

56% of respondents disseminate warnings as received from source, while 44% of respondents indicate that they provide suggestions/advisories together with warnings, to department stakeholders and communities. In contacting community leaders, members of TDMC usually depend on mobile phones (both call and SMS). Members of TDMC believe that recipients of warnings have capacity to undertake necessary measures, in response to warnings – particularly onward dissemination of warnings in communities through loud speaker, for anticipating potential risks; generally, community decisions largely follow rules and regulations imposed by GAD, in responding to warnings. 83% of respondents indicated that their institutions have mechanisms for confirming receipt of warnings through event reports to GAD.
94% of respondents find DMH-generated warnings useful, with advisories provided from district/regional offices. About half of total number of respondents recognizes initiatives undertaken by GAD, Myanmar Red Cross Societies, NGOs and projects – including BRACED – for enhancing local capacities in receiving and utilizing forecasts/warnings.

Majority of stakeholders (67%) expressed that a feedback mechanism, on forecast generation and application, is not in place in Mawlamyine. Those who participated in forecast translation trainings and Monsoon Forums indicated that they were able to articulate feedback and recommendations to DMH, and other institutions relevant for preparedness/disaster risk reduction/resilience.

2.2.6.b Current Mechanisms of Climate Information Receipt, Understanding, Analysis and Application in VDMC

Shwe Myine Thiri Ward

Flood is considered as the key recurrent hazard in Shwe Myine Thiri Ward, occurring more than twice annually due to on-site rainfall; the ward is also proximate to Than Lwin River, hence rainfall upstream also impacts on the ward. Next to flood, key climate concerns include extreme temperature (particularly during the months of April and May), water insufficiency during the dry season, and fire. Shwe Myint Thiri Ward is home to ethnic minorities of Mon and Karen.

Myanmar-speaking respondents confirm access to climate information, which are focused on daily weather forecast and warnings (flood, heavy rainfall and storm surge). Information are largely accessed via radio and television; complemented with access to social media (Facebook) and newspaper.

For the Myanmar-speaking respondents, most had the perception that warnings are easy to understand; validation however offers insights that understanding of forecast in the community is partial at best. There is recognition, among respondents, of the capacity building contributions of local NGOs and development organizations under various programs and projects (BRACED included), for improving current capacities. A key challenge articulated in the community is the disinterest of the population in listening to weather forecasts.

Dissemination of warnings in the community is often done with advisories for evacuation, as deemed necessary. These advisories are largely adopted from general advisories received from the township; there is no mechanism for further customization of advisories for the ward.

Dissemination to community members is usually done through loudspeakers. Feedback mechanism on the receipt, understanding, analysis and application of climate information is not systematically established in the ward.

Zay Yar Thiri Ward

Stakeholders identified flood as a key hazard in their ward, associated with heavy rainfall during the monsoon and during the cyclone/storm season. Fire, due to a variety of reasons (including high temperature and low rainfall), has high annual recurrence in the ward, particularly during the hot, dry months. Most severe events were the fires in 1991 and 1992, flood in 1994, and Cyclone Nargis in 2008. Tornado has been recorded in the community (2014), with significant impacts (collapse of houses and school building). Zay Yar Thiri Ward hosts ethnic population of Mon, Myanmar, and Karen.

Most espondents confirm access to climate information (flood, storm, strong wind, storm surge, cyclone and heavy rainfall warnings) from DMH through radio and television; other channels for accessing climate information are social media (Facebook) and newspaper.

Community respondents (63%) perceive warnings as easy to understand; however, validation indicated limited understanding thereof. 37% of respondents underscored that warnings are difficult to understand. For ethnic dialect speakers, assistance is received from Khune Myae Saytanar organization for better understanding of forecasts. There is a marked disinterest of people in forecasts, particularly when adverse impacts are not anticipated.

General advises are usually received by Village Administrators/VDMC members from the Township GAD; there is no practice of further customizing the advisories to local areas and conditions, due to confidence of end-users in understanding the actions that they have to undertake, without specific advisories. Response options identified vis-à-vis warnings (particularly for cyclone) are mainly connected to evacuation, as may be assessed as required. Dissemination of warnings is done through loudspeaker.

Community stakeholders highlighted assistances received from NGOs (particularly WV, as part of BRACED) for enhancing resilience particularly on enhancing drainage systems, and construction of bridge, road, and water pond.

There is no systematic confirmation of receipt of warnings; nor is an effective feedback mechanism established.

2.2.7 Meiktila

2.2.7.a Current Mechanisms of Climate Information Receipt, Understanding, Analysis and Application in TDMC

Flood is considered a priority hazard among 73% of respondents in Meiktila; flood recurs annually in the township. Fire is identified as another priority hazard, which recurs annually, particularly during the dry and hot season. Heavy rainfall (18% of respondents) and drought (9% of respondents) are other key hazards identified. Most severe events were the flood in Thel Taw Lay Village, due to the swelling of Mung Tai River, in 2001-2002; drought in 2011; and fire in 2012.

Like in all other townships, 100% of respondents confirm access to climate information. Forecasts accessed are daily weather (55% of respondents) and monthly forecasts (9% of respondents); El Nino outlook (36% of respondents, as when El Nino is present) is also accessed. Meiktila is the only township where respondents pay attention to El Nino outlook. All other information accessed are warnings – storm surge warning (45% of respondents), cyclone warning (45% of respondents), flood warning (18% of respondents), scanty rainfall warning (18% of respondents; other warnings accessed are strong wind warning, untimely rainfall warning, low flow warning, and flood bulletins. The range of climate information accessed by respondents from TDMC is in Figure 16.

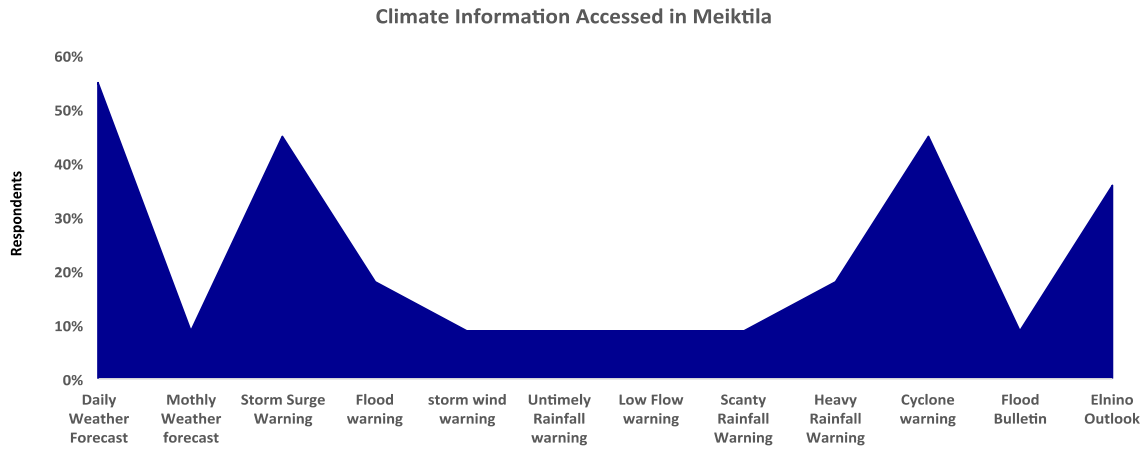

Figure 16. Climate information accessed in Meiktila. Daily weather forecast and warnings are highly accessed. Meiktila is the only township where respondents access El Nino outlook

When categorized further, 64% of respondents access warnings only; 18% of respondents access forecasts only; and another 18% of the respondents access a combination of forecasts and warnings.

82% of respondents source information mainly from DMH; all are counterchecking with GAD, RRD and other sources. 18% of respondents are solely dependent upon orders/instruction from GAD. Main channels of forecast/warning receipt are radio, mobile phone, television, social media (Facebook), newspaper and person-to-person communication. Figure 17 provides the details.

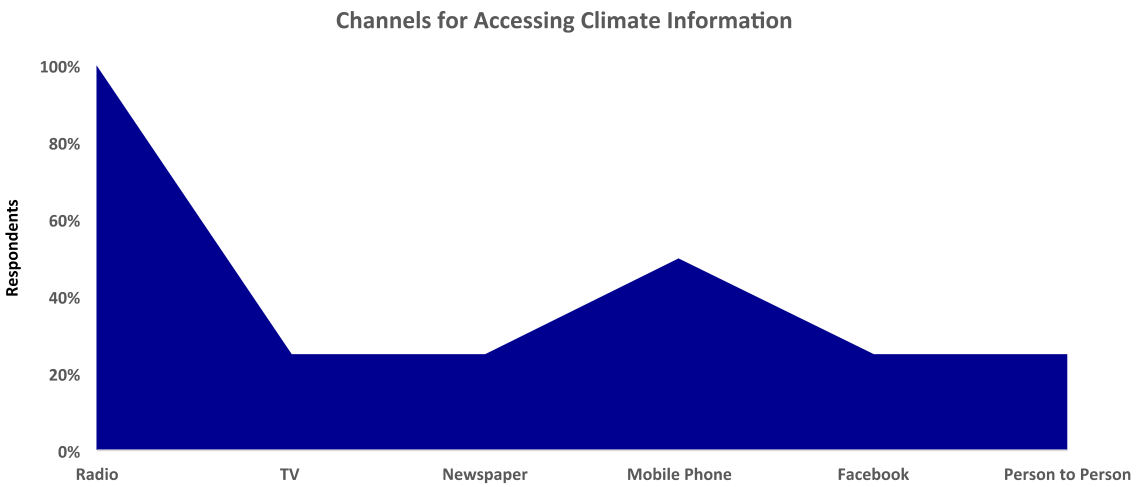

Figure 17. Key channels for accessing climate information in Meiktila Township

Perception is high in TDMC on their understanding of forecasts/warnings; 82% of respondents indicated that they find forecasts easy to understand. Validation of this suggests that there is better understanding of forecasts in those who participated in the BRACED-supported forecast translation and application training; there is still the requirement, though, for them to refer to the list of terminologies and definitions that they have from the training. While forecast seems easy to understand, terminologies imbedded therein requires understanding in order to fully understand the forecast. 18% of respondents find forecasts difficult to understand.

At the township, 55% of respondents indicated that they have capacity and experience in anticipating potential impacts, and assessing response options, based on warnings (flood warning). Although 45% of respondents do not practice forecast analysis to derive at a set of potential impacts for guiding actions, receipt of orders/instructions from regional offices/officials on actions that should be undertaken guides decision-making in the local level. For example, the local DOA provides advisories to farmers to choose crops for planting, upon advise from regional authorities. The regional sectoral departments play a key role in the decision-making of township sectoral departments; many of them were able to participate in the Forecast Translation and Application Training in Mandalay, convened by DMH and facilitated by BRACED.

55% of respondents disseminate warnings as received from source; 45% of respondents provide suggestions/advisories together with warnings, to department stakeholders and communities. Most of sectoral departments contact community leaders (and DRR committees, if established) via mobile phone, SMS, Viber groups, and official letter. Respondents believe that community recipients have capacity to undertake necessary actions at the community level; necessary actions, in the context of respondents, largely mean onward dissemination of warnings for community understanding of possible/potential risks. Community stakeholders are also guided by GAD procedures in undertaking actions. The key mechanism, for receiving confirmation from message recipients, is log book signing, as indicated by 55% of respondents. A primary challenge in disseminating information is the lack of interest, on the part of recipients, on forecasts/warnings.

82% of respondents find DMH-generated warnings (particularly rainfall and strong wind warnings), together with advises from regional and district authorities, useful when applied in their plans and decisions. Respondents recognize the on-going efforts for addressing gaps in information generation and application, by various government institutions, NGOs, and projects – BRACED included.

The only feedback mechanism in the township are the trainings conducted as part of BRACED and when respondents participate in the Regional Monsoon Forums. None other existed in the township.

Respondents feel that advocacy for senior officials, should be a first priority, for application of climate/forecast application for both for resources and risks management, and development/establishment/legislation of policy and rules for implementation of the same at different levels. This realization was made when respondents participated in the BRACED-supported training on forecast translation and application (22% of the respondents were trained); the training facilitated their understanding that there is substantial potential for utilization of forecasts/warnings for risks management and ensuring productivity in various sectors; and provision of advisories to encourage risks management and productivity can be pursued for sub-township, village tracks, and villages.

Respondents trained realize, however, that this knowledge will not be translated into action until senior officials – at the national and regional levels – are convinced in changing policies and decision-making.

Respondents identified that for enhanced disaster risk reduction/resilience, improvements in water flow facilities around the city should be undertaken; rainfall monitoring should also be in placed in critical areas, to improve early warning; and financial resources for implementing projects and capacity building for improved DRR and resilience in the township and across its communities, should be available.

2.2.7.b Current Mechanisms of Climate Information Receipt, Understanding, Analysis and Application in VDMC

Koke Ko Taw Village

Situated in the dry zone, Koke Ko taw Village is exposed to opposite events – heavy rainfall during the wet and cyclone seasons, and drought during the hot and dry months. Typically having very low rainfall, the village has access to water for irrigation and domestic use from Thae Chaung canal/tributary; access to water, however, is mainly possible when there is rainfall upstream. The villages identified drought, water scarcity, and strong wind as key recurrent hazards. Drought, the most recurrent, impacts more on subsistence farmers. Large-scale commercial farmers who have access to irrigation are least affected. Occasionally, flood occurs due to the swelling of the canal, from upstream rainfall, like in 2002 when the whole village was affected, and casualties were recorded.

From 2012-2015, severe drought was experienced in the village which had extensive impacts to agriculture and livestock production. Due to the severity of impact, some households migrated to other towns for livelihood.

Access to climate information is high, as articulated by respondents. Climate information is mainly accessed from informal/unofficial sources; advises from GAD, IWRUMD are also considered important; DMH information is accessed less by stakeholders. Access to information/unofficial information source is through radio, television and internet-based platforms. All information accessed are warnings (cyclone, flood, heavy rainfall, low flow warnings).

53% of respondents perceive good understanding of climate information accessed; putting this perception to test, on the other hand, indicates only partial understanding of information received. Moreover, 47% of respondents requires assistance for understanding warnings. Uncertainties associated with forecasts/warnings are among the main concerns by village respondents, due to implications to livelihoods. The dependence on traditional knowledge is high in the community.

Main response options undertaken, in the agriculture sector, is prioritization of hazard-resistant crop for plantation, driven by their previous experiences, rather than by forecast. Resilience activities are contributed by AAM, through availability of drinking water facilitated by water ponds established in the village.

Warnings are disseminated as received from source, using person-to-person communication or hand speakers. Confirmation of receipt of warnings, and provision of feedback, is not a practice in the community.

Yae Ngan (West) Village

As with other villages in Meiktila, Yae Ngan West is experiencing water scarcity, particularly during the hot and dry months; and heavy rainfall and its secondary hazards during the wet and cyclone seasons. The village was also severely impacted with the 2012-2015 drought, which forced many community members to migrate to other areas in search of livelihoods. Droughty/water insufficiency is an almost annual experience, the village being in the dry zone. Villages pay attention to cyclone warnings, due to anticipation of possible rainfall in their area. Community members, however, could not properly anticipate the potential amount and period of occurrence of rainfall. This water deficit mainly affects subsistence farmers in rainfed areas; those with access to irrigation, particularly large-scale commercial farmers are impacted less.

All respondents are accessing DMH-generated climate information; almost half of respondents compare this information with those generated by informal/unofficial source of information; preference of stakeholders to information/unofficial source is due to availability of more detailed information which, to their view, makes them understand the forecast/warning better. Information mostly accessed are warnings (cyclone and flood warnings), with some respondents accessing up to 10 days forecast. Main channels for accessing climate information are radio, television and internet-based platforms.

52% of respondents stated that they need assistance in understanding warnings/forecasts and 48% expressed that warning information are difficult to understand, due to technical information imbedded therein. Respondents indicate that they require capacity building for enhancing their understanding of forecasts. Partly due to this and through cultural influence, traditional practices/knowledge is often used in anticipating future weather/climate.

Driven by community experiences, response options undertaken by farmers is to choose hazard-resistant crops. Forecast uncertainties are among the issues affecting information utilization by farmers, as they need to establish confidence in the forecast.

Only warnings are disseminated widely in the village, through hand speakers and/or person-to-person communication. Warnings are disseminated as received from source. Confirmation of receipt of warnings and provision of feedback on the understanding, analysis, and application of forecasts are limited at best.

3. CAPACITIES, GAPS, and REQUIREMENTS ANALYSIS

Myanmar's DRR Work Group (2013), highlighted that Myanmar (both in the context of the government and communities) has not accumulated significant experiences in managing risks of natural hazards. On community capacity, the DRRWG identified CBDRR processes to be largely cyclone centric. Although enhancements have been reported, and utilization of forecasts for anticipatory actions are increasing, this is happening incrementally and largely focused on immediate threats from warnings.

Myanmar's government's focus for capacity building vis-à-vis hazards and climate change largely focus on improving readiness to offer timely emergency assistance, while the systematic approach for reduction underlying vulnerabilities has received less attention. While developments have been notable in recent years particularly on policies vis-à-vis mainstreaming DRR in some sectors, sustained work, from the government and development secrtors are required for ensuring implementation of new policies o down up to communities (UNICEF, 2015).

Key capacities and gaps have been articulated by stakeholders, in end-to-end information generation and application system, in the series of DMH-convened National and Regional Monsoon Forum events. From these information generator-user dialogues, stakeholders underscore requirements in: the following for enhancing DRR and productivity:

- improved spatial and temporal forecast resolution and enhanced forecast accuracy
- receipt of information of various timescales by stakeholders from national sectoral institutions up to communities
- capacity building of user sectors, from national to community levels, to enable better understanding, analysis and application of information of various timescales
- development of tools for assisting user sectors and communities, to convert forecasts of different lead times into sector-relevant advisories
- robust feedback system, from communities and institutions to DMH, for facilitating user demands-driven evolution of information products
- regular and sustained dialogues, between DMH and users institutions and communities, for continuous improvements in DMH-generated products and skills in application of climate information of various lead times by users

FGDs conducted in township and community levels, in an effort to better understand capacity requirements of decision makers in various sectors in townships and communities in applying climate information, provide details that support discussions of sectoral requirements in the series of National and Regional Monsoon Forums.

3.1. CAPACITIES, GAPS, AND REQUIRMENTS IN TOWNSHIPS

Access to Climate Information

100% of respondents from TDMCs across townships of Dagon Seikan, Hpa-An, Keng Tung, Kyauk Phyu, Labutta, Mawlamyine and Meiktila confirm receipt of mainly warnings and short-range forecasts (in Figure 18), mainly from DMH. In the townships, attention to climate information is at its peak in cases of severe weather events.

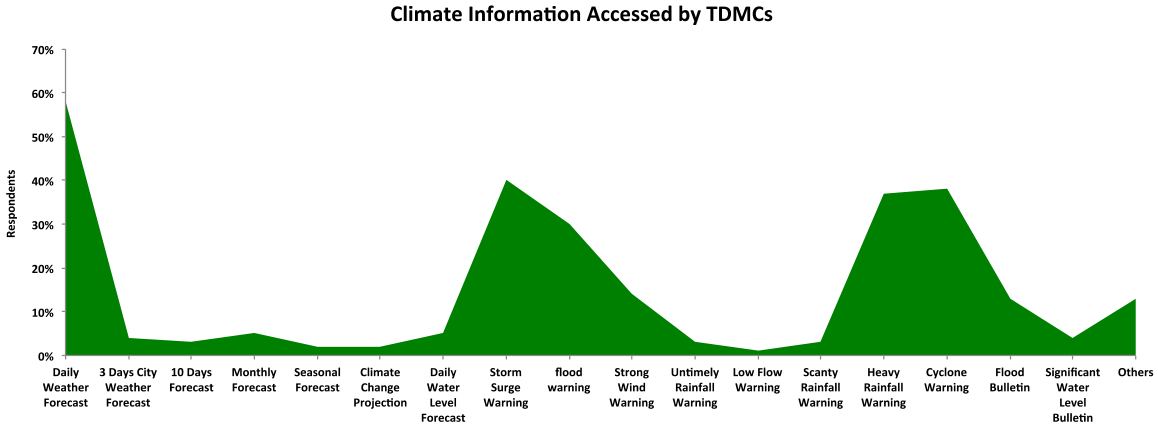

Figure 18. Climate information accessed across townships. Most accessed information are daily forecast and warnings. Longer-lead time information are accessed less; historical data is not accessed at all.

Longer-lead time information is getting less attention, due to a variety of reasons (i.e. limited awareness among stakeholders of longer-lead time information from DMH, unappealing presentation/packaging thereof, non-understanding of forecasts and incapacity of stakeholders to analyze and translate the information into sector-relevant potential impacts outlook and viable response options, coarse forecast resolution, etc.). While stakeholders often mention about climate change/climate change adaptation, climate change scenarios are among the least accessed of all the information available from DMH.

Across townships, the most popular source of information is television (65% of total number of respondents), followed by mobile phone (55% of total respondents), fax (55% of total respondents, social network (Facebook; 43% of total respondents). Other channels used in accessing climate information is radio (37% of total respondents), website (29% of total respondents), person-to-person communication (17% of total respondents), Viber (17% of total respondents), newspaper (18% of total respondents), SMS (14% of total respondents), and mail (14% of total respondents). Access to information via mobile phone (DAN, Disaster Alert Notification) remains limited at 7% of total respondents, largely due to incapacity of TDMC officials in utilizing mobile application. Figure 19 elaborates this.

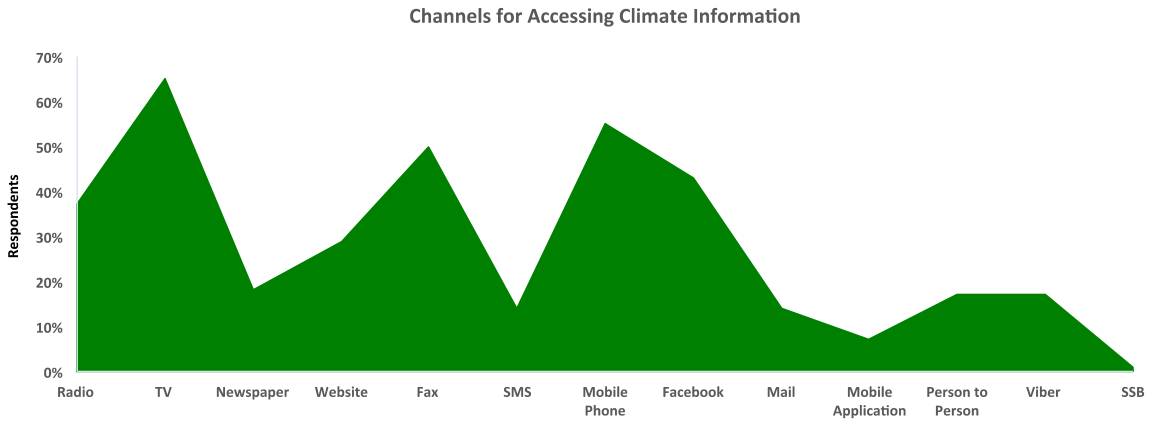

Figure 19. Channels of information used by respondents across Dagon Seikan, Hpa-An, Keng Tung, Kyauk Phyu, Labutta, Mawlamyine, and Meiktila

Improved basic services and technology has contributed tremendously to enhanced access of stakeholders to climate information. Television as a source of information was ushered mainly by better electrical connectivity in townships. Mobile phones, which was highly inaccessible to the public a decade ago, has become one of the most used channels for accessing climate information due to improved affordability of subscriber identity module (SIM) cards and fast development of telecommunications network around the country. Due to accessibility of mobile phones and internet data, social media platforms – particularly Facebook – has gained prominence as a channel for accessing climate information. DMH, recognizing better connectivity with information users through Facebook, has established its Facebook page in 2015.

In TDMCs, the utilization of fax machines for receiving climate information remains high; transmission of official communication/orders in Myanmar's government system is still largely done through fax machines. The opportunity provided in the current availability of technology is that TDMC officials are able to get early warning from via other channels, prior to receipt of official communication/instructions via fax machines.

Mobile application starts to provide a contribution to enhancing access to climate information in the townships; the maximized use of mobile phones, however, is anticipated to take time, as stakeholders gradually build their capacity in using climate-related mobile application. Websites, as channel for climate information, remains to be accessed less by stakeholders.

Likability of Information

Climate information is generally regarded as uninteresting by stakeholders. For enhancing public interest in forecasts/warnings, information has to be packaged with the end in view of capturing people's attention. Forecasts appear to be too technical for sectoral stakeholders, which is a deterrent for most to gain interest in the information provided. Stakeholders prefer information which is easy to understand, customized for their sectors, and presented in interesting formats like symbols, cartoons, color codes, etc.

Competing and differing information received from various sources tend to decrease, over time, interest and confidence of stakeholders in forecasts/warnings. DMH has to be recognized widely as the mandated and authoritative source of information in Myanmar, for reducing confusion among information recipients. While current technology aids in the availability of DMH-generated information through various channels, some stakeholders find that more elaborate and clearer explanation on anticipated weather/climate conditions can be obtained from informal/unofficial sources. Generally, capacity of DMH scientists in effectively communicating forecasts has to be further enhanced, to capture interest of users.

Understanding of Climate Information

Perception is very high across townships that forecasts/warnings are well understood; validation suggests otherwise. To a large degree, this misconception bars stakeholders from initiating efforts at better understanding of forecasts.

One of the most significant contributions of the BRACED-supported Regional Monsoon Forums and trainings on understanding, analysis and application of climate information of different lead times for user sectors, has been to make those who were able to participate therein discern their gaps in understanding forecasts, and recognize other information products from DMH, other than short-range forecasts and warnings. While the capacity building for

interpretation/understanding of forecasts needs to be sustained, the Monsoon Forum events and user sector trainings provided the necessary dialogue between DMH and stakeholders for enhancing the latter's capacity in understanding forecast products of different lead times.

Stakeholders pointed out, however, that the current Monsoon Forums and trainings are introduced largely at the Regional Level, with limited participation of township stakeholders. Ideally, stakeholders prefer for this dialogue process to be established and sustained in townships. At some townships, local trainings on understanding, analysis and application of forecast information has been conducted in some townships per stakeholders' demand, this is yet to be sustained as a regular capacity building process, as part of the townships' disaster risk reduction initiatives.

There is also recognition, across townships, that focal points who should be equipped, trained and dedicated to receiving and "decoding" climate information have to be identified and established.
The availability of easy-to-understand pamphlets, with terminologies defined and symbols provided, were highly advocated by respondents. Direct communication with DMH is desirable, for discussions especially in situations where potential hazards require utmost attention and immediate action.

Translation of Climate Information

It is highly notable that while high percentage of township stakeholders indicate that they can anticipate potential impacts from warnings, the dependence vis-à-vis decision-making on actions that should be undertaken in anticipation/face of various hazards relies heavily on regional/district authorities. Albeit confined to a limited number, in every township there exists stakeholders who are not accessing forecasts/warnings from DMH or any other sources, but rather only awaits advises/instructions from supervising regional/district authorities.

Devolution of decision-making powers, in government sectors, remains a work in progress in Myanmar. The capacity building of townships to fully take charge of decision-making, relevant to preparedness against anticipated hazards, could require time and experienced-based learnings to be meaningfully realized. Along with the process of strengthening decision-making in preparedness at township TDMCs, efforts at enhancing decision-makers' capacity in anticipating potential impacts from climate information of different lead times, and developing strategic and viable response options for reducing risks and furthering opportunities should be complementary.

Analysis of forecasts for resources management is not yet undertaken by most of TDMCs; interest in forecasts and analysis of its implications, are generally in the context of risks management. For usefulness of climate information (i.e. optimizing resources utilization and productivity in addition to management of risks), township decision-makers and sectoral stakeholders have to be capacitated in analyzing climate information relevant to opportunities that could be offered by future weather/climate conditions, in addition to analysis of potential risks. Climate change projections, which is salient to development planning, is accessed at a minimum and hence, generally not analyzed at the townships.

Dissemination of Advisories

As mentioned earlier, forecasts/warnings are generally analyzed in the context of risks management. Hence, what are disseminated to sectoral stakeholders/communities are largely warnings.

Dissemination of warnings/advisories (i.e. actions recommended to be undertaken) are generally carried out in townships upon orders of higher authorities. While it takes time for TDMCs to fully develop the capacity to make decisions on what advisories are to be provided and when to provide the same, capacity building/development institutions should have sustained engagement with TDMCs to assist in this capacity building process.

Poor communication channel is a challenge in dissemination of advisories, particularly from townships to remote communities. Dissemination of advisories is especially a challenge in areas with high reliance on mobile phone and internet connection, as power outages, mobile network signals, and other factors affect the effectiveness and efficiency of dissemination of advisories/warnings; in many townships, the delivery of warnings/advisories to communities still depend on outmoded mechanisms, like mail. Sufficient and effective communication equipment has to be provided in townships and communities in order to efficiently undertake dissemination of advisories. Established experiences in Myanmar connected remote villages to DMH and GAD, through very high frequency (VHF) radio communication that enables reliable long-distance two (2)-way connectivity.

It is anticipated that enhancements in technology will continue to improve the dissemination of of climate information to end-users. Regular assessment of township-specific communication equipment requirements, against available technology in Myanmar, is advocated.

Application of Climate Information

Practices in application of climate information have been reported in the series of National and Regional Monsoon Forums, albeit in “pockets”; these practices have been contributed by various capacity building interventions, in disaster risk reduction, undertaken by both government and development sectors through projects/programs (including BRACED, as recognized by respondents). Wide-spread, well coordinated national-to-community experiences in climate information application for resources and risks management remains to be established in Myanmar.

Arguably, one of the key impediments in taking anticipatory decisions that cuts across various levels of governance, based on forecasts/warnings, is that national policies that require such actions are not in place. Township stakeholders opine that unless effective policies are enacted, in informed disaster risk reduction and climate change adaptation, for enabling senior national, regional, district and township officials to take proactive decisions that ingest climate information of different timescales, the focus of plans and decisions could remain isolated and in post-hazard emergency assistance.

In TDMCs, few have been trained in disaster risk reduction that integrates climate information of various lead times in planning and decision-making. Other key challenges identified in undertaking appropriate and effective responses to information are limited lead time in warnings, insufficient coordination between government departments, and non-availability of

resources to aid anticipatory actions. Uncertainties associated with forecasts/warnings further contribute to lack/insufficient confidence of decision-makers in taking decisions.

Strengthening capacities for climate information application requires complementary multi-level, multi-approaches interventions. As indicated earlier, policies that favor proactive, pre-hazard informed decision-making is advocated. As part of such policies, resources could be made available for pre-hazard preparedness, based on forecasts/warnings. Capacity building in integrating forecasts/warnings in plans and decisions has to be undertaken across all levels, from national to local. BRACED efforts vis-à-vis Monsoon Forums and trainings on forecast translation and application have been identified by respondents in addressing gaps in the utilization of climate information of various timescales. In order to optimize impacts, these efforts have to be sustained/continuous, and implemented not only in the regional and township levels, but in communities as well. In addition to local government decision-makers, it is further advocated that development workers in townships be included in this capacity building, for improved disaster risk reduction/climate change adaptation interventions.

For replication of relevant experiences in climate information application, video documentation is expressed by stakeholders as the most effective way of encouraging and inspiring others. Government and development organizations interventions for scaling up good practices across Myanmar's most vulnerable areas Is expected to contribute to overall improved disaster risk reduction and resilience.

Feedback

Except for the BRACED-facilitated Regional Monsoon Forums, and regional and township trainings on forecast translation and application, there have been no other feedback mechanisms that connect townships to DMH. These feedback mechanisms have facilitated DMH's acknowledgement of users' requirements and better appreciation of its role not only as a generator of climate information, but one that constantly adjusts its services based on user demands/requirements.

In facilitating continuous improvements in climate information, feedback mechanisms like those above-mentioned, have to be firmly sustained in townships.

3.2 CAPACITIES, GAPS, AND REQUIREMENTS IN COMMUNITIES

Access to Climate Information

Climate information accessed in villages/communities, are highly limited to short-range forecasts and warnings; attention to warnings is especially high due to anticipation of potential risks to lives, assets and livelihoods. Analysis of data from communities suggests that longer-lead time information is least accessed and has the lowest awareness among stakeholders. Access to long-term climate change projections in communities is nil. Details of access of communities to climate information is provided in Figure 20.

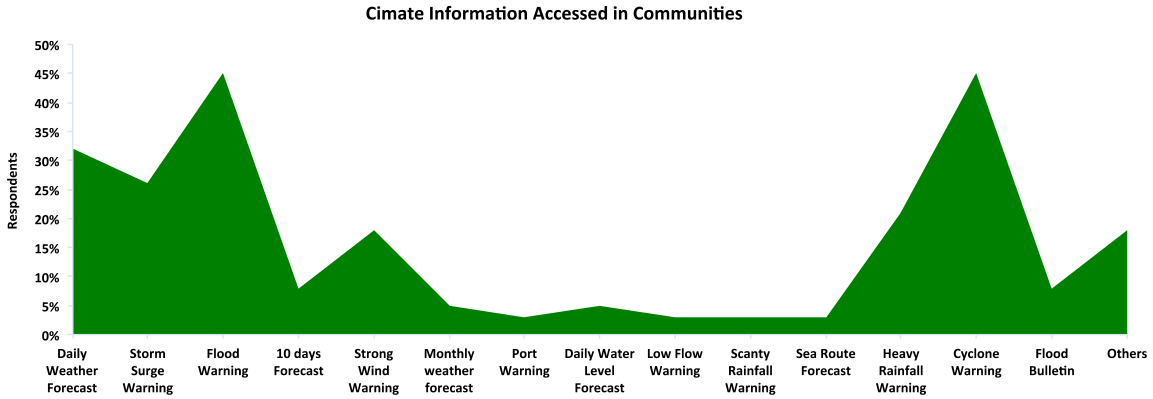

Figure 20. Climate information accessed in select communities in Dagon Seikan, Hpa-An, Keng Tung, Kyauk Phyu, Labutta, Mawlamyine and Meiktila

Like in townships, DMH is the primary source of climate information in communities. Information accessed from DMH is usually counterchecked with other information from GAD and RRD. Communities close to Thailand border, particularly in Kayin and Shan States, access information from TMD.

Radio, followed by television, remains a highly prominent channel for receiving climate information in villages. The spread of smart phones, coupled with enhanced mobile network coverage internet connectivity, ushered the use of both mobile phone and inter-based based social network (i.e. Facebook) in receiving forecasts/warnings in communities. Moreover, person-to-person communication remains one (1) of the mechanisms for receiving forecasts/warnings by community focal points. Figure 21 supplies details of the most preferred channel for receiving climate information by community respondents.

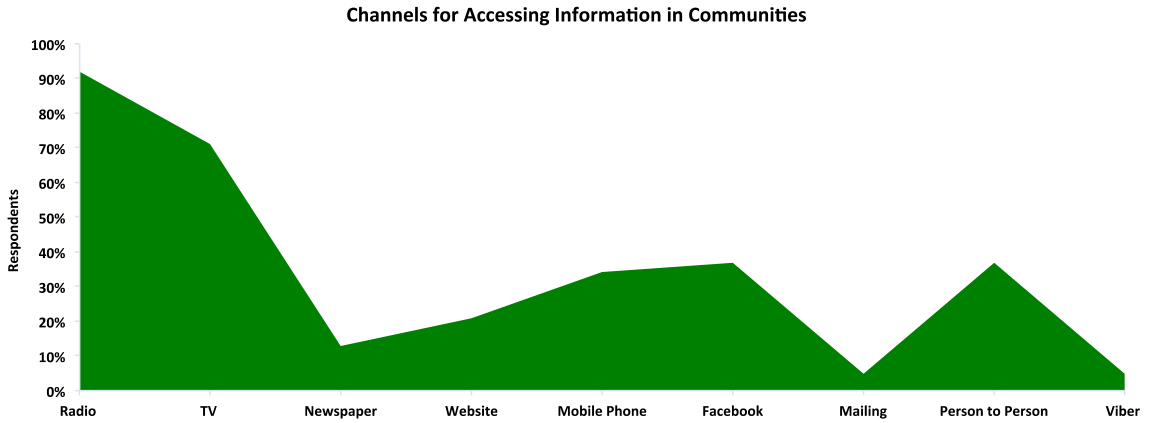

Figure 21. Channels for accessing information in communities in Dagon Seikan, Hpa-An, Keng Tung, Kyauk Pyu, Labutta, Mawlamyine, and Meiktila

Access to climate information is most challenging in areas where population use ethnic dialects, in various States. In these areas, the utilization of radio is limited to accessing radio stations that

utilize local/ethnic dialect in programming. Because forecasts/warnings are not available in local/ethnic dialects, interest in accessing the same is lowest in ethnic areas. Village Administrators/VDMC Members who understand and speak both Myanmar language and ethnic dialects are key bridges of climate information to ethnic minority groups. There are, however, no robust mechanism for provision of climate information in various ethnic dialects across the townships. Particularly in communities where access to climate information remains minimal (including remote villages), communities utilize traditional practices for "anticipating" future weather/climate.

The condition of basic facilities like electricity, road network, and telephone connection, among others, also contribute to the level of access of communities to climate information. Considering key mechanisms for receiving forecasts/warnings in communities, challenges are paramount in areas which are remote and have unstable electricity and telephone connections.

In coastal areas, safety of fishermen and those involved in water transportation is highly dependent on access to information. Access to information, by off-shore stakeholders, is highly restricted due to availability of robust long-range communication equipment that can connect fishermen and water transport operators to VDMCs (and TDMCs). Marine high frequency singe-side ban radios/VHF radios can provide this connectivity, but installation of facilities requires arduous, lengthy and extensive government approval procedures.

Improvements in access of information in communities have to be undertaken holistically. Enhancements in basic facilities are expected to redound to better access of climate information; availability of information in local dialects is key for making the same accessible for all, especially for those at-risk.

For better receipt of climate information among working population, airing of the same by DMH, via FM radio late in the afternoon, is preferred.

Likability of Information

Community respondents prefer for climate information to be packaged in a way that captures public interest. Indications, particularly from community respondents, were conveyed that one key challenge in making people access and utilize climate information is that they appear "bland". For obtaining better attention, information could be packaged as cartoons, color codes, symbols, with complementary explanations provided in simple text; very technical information tends discourage interest of community stakeholders from climate information.

The availability of climate information from various sources (DMH and other sources), widely available via online platforms and tri-media, creates confusion in some community stakeholders, particularly when climate information for the same areas differ. In instances where differing information/warnings from various sources are available, many stakeholders are confused on the believability of information and lose confidence in utilizing any of the information available. An ideal mechanism for addressing this concern is for informal/unofficial information sources to collaborate with DMH, for enhancing analysis and generation of forecasts/warnings, rather than generating competing information products.

Understanding of Climate Information

For Myanmar language-speaking communities, there is lofty perception on understanding of forecasts/warnings. Similar to townships, validation of this perception suggest only partial understanding of forecasts/warnings and capacity building (trainings, awareness programs, availability of simple and explanatory information materials on various forecast/warning products) is required in communities for enhancing the same. Direct communication with DMH is desirable, for discussions especially in situations that require utmost attention and immediate action.

Dialogues between DMH and users, and trainings on understanding, analysis of sectoral implication of forecasts, and undertaking preparedness measures which are currently focused at regional and township levels, have to be implemented in communities.

VDMC members, in each community, who are to be properly equipped, trained, and dedicated as focal points for ensuring connectivity to and understanding of climate information among community members, have to be identified.

Translation of Forecasts/Warnings

In communities, anticipation of potential impacts from various hazard events are driven by local experiences (i.e. general impacts of heavy rainfall, flood, cyclone, storm surge, landslide, drought, etc.) The different hazard magnitudes however, are not identified based on warnings. Identification of hazard-related actions are largely in accordance with advices from GAD. Further, in most communities, post-hazard actions remain the key focus.

Improved capacity of communities in anticipating potential impacts based on warning magnitudes (e.g. cyclone warnings, for example, have to be better analyzed not only on its potential for landfall/crossing Myanmar, as with the current color code system, but also on its range of wind speed, potential rainfall, and other secondary hazards), has to be pursued through trainings. While guidance from and coordination with townships are important for effective preparedness, communities' competence at analyzing potential opportunities and risks relevant to local conditions should be improved.

Dissemination of Advisories

In communities, loudspeakers are assets for dissemination of advisories; not all communities, however, have established local capacities for dissemination of advisories. Information disseminated are largely warnings, with specific information to be disseminated guided by GAD.

Information dissemination systems have to be enhanced in communities, through provision of sufficient number of public address systems for ensuring receipt of information by community members. In communities, loudspeakers are best for mass information sharing; loudspeaker have to be complemented with other mechanisms for mass information sharing (mega phones, microphones with speakers, bells, etc.), for ensuring redundancy.

In areas with ethnic population, focal points have to be determined to facilitate translation of warnings in Myanmar language, into ethnic dialects.

VDMCs have to be trained, such that they can generate local advisories, and prioritize dissemination of advisories to those who are facing highest potential risk. Further, VDMCs have to be trained in disseminating not only advisories associated with potential risks, but those which could enhance resources management and productivity.

Application of Climate Information

Anticipatory actions vis-à-vis hazards are mostly guided by community experiences (e.g. strengthening of dikes in anticipation of floods) and guidance from GAD.

In communities, a key challenge identified in undertaking effective responses to forecasts/warnings is the limited authority of and resources available to VDMCs in taking pre-hazard actions.

Community respondents strongly feel that there is a requirement for interventions on enhancing capacities to utilize climate information in different sectors through trainings and field schools. Risk information customized to communities are essential for facilitating community decisions. Sharing of good practices in climate information application, through stories and video documentation, could enhance insights on decision-making processes. Stakeholders articulated strong indication that community access to, and utilization of, climate information is closely linked to availability/improved facilities like electricity, roads, and telecommunications, among others.

Those who were able to participate in BRACED-facilitated Monsoon Forums and forecast translation and application trainings recommended that maximum benefits from such activities could be achieved if they are widespread and sustained (i.e. implementation across townships and communities over a long period of time).

Complementing the utilization of climate information, environmental protection have to be pursued in order to minimize impacts of hazards in communities.

Feedback

Except for BRACED-facilitated trainings on forecast translation and application, and Regional Monsoon Forums, there are no other feedback mechanisms that connect township and community stakeholders to DMH. For facilitating robust feedback mechanisms, communication equipment ensuring connectivity of communities to higher level authorities and DMH have to be established and maintained; regular dialogues between DMH and community stakeholders have to be maintained at least annually in communities; and focal persons for communicating regular feedback from community members, to GAD and DMH have to be identified and capacitated.

4. KEY RECOMMENDATIONS AND SUGGESTED ROAD MAP

The utilization of climate information, for disaster risk reduction, let alone resources management, is a young and budding capacity in Myanmar that needs to be nurtured and sustained. Hazard impacts in the country remain high, driven by people's vulnerability (physical, social, economic, and environmental). Issues and challenges pertaining to informed pre-hazard preparedness, for reducing risks and enhancing productivity, exacerbate vulnerability.

Myanmar is in the forefront of tremendous capacity building and development ushered by the recent changes in political landscape, and government and donor interventions. Key to these efforts is enhancing DRR and resilience amidst natural hazards.

DRR and resilience are effectively undertaken through the seamless integration of climate information of various timescales in plans and decisions (in Figure 22).

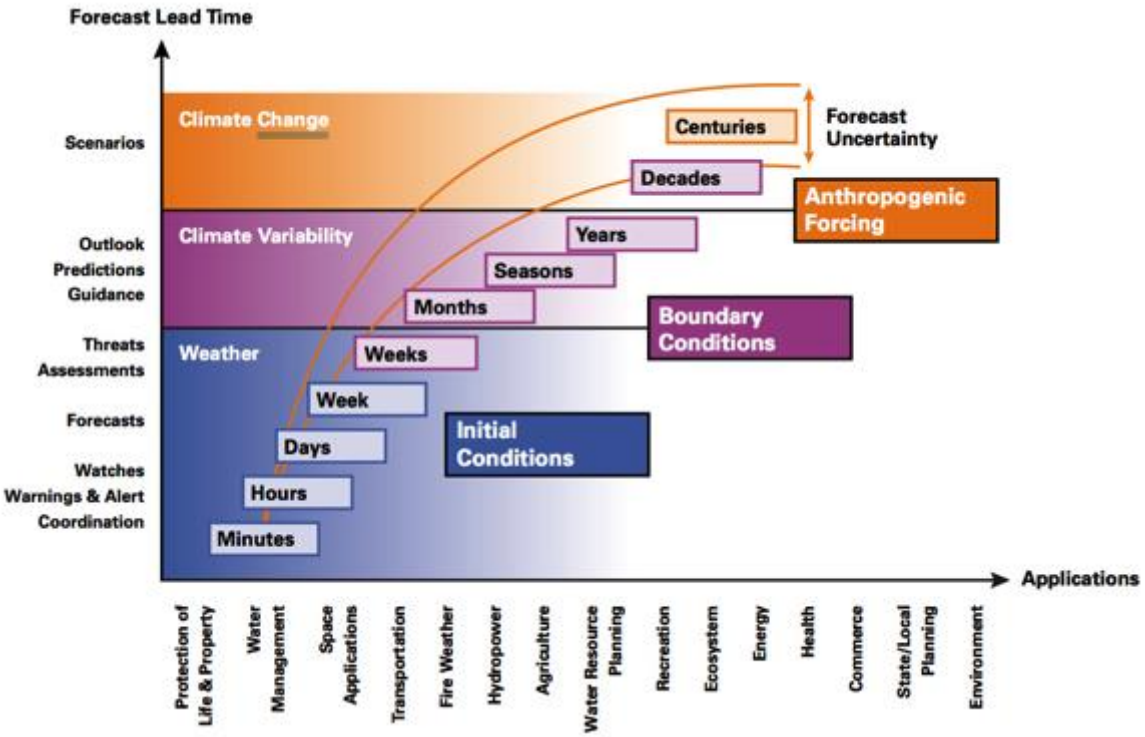

Figure 22. Seamless application of climate information of various lead times in planning and decision-making (WMO)

This study suggests limited access, understanding, analysis, and application of available climate information from DMH, by both townships and communities, due to a variety of factors. Current access and utilization of climate information are confined to short-range forecasts and warnings; actions undertaken are also limited to onward dissemination of warnings and evacuation; other actions undertaken are guided by decisions of regional/district authorities. Long-term historical data and climate change projections, which are key to resilient development planning are least accessed.

To a large degree, government institutions and development organizations in Myanmar focus on post-hazard emergency assistance provision.

Recommendations, for enhancing application of climate information are provided hereafter:

1. DMH

Key improvements in forecast generation, as required by users, include enhancements in spatial and temporal forecast resolution. Improved communication of forecast using simplified terminologies, and presentation of forecasts and warnings using symbols, cartoons color codes, pamphlets, posters and other similar mechanisms are required for inviting better attention and interest of users in townships and communities in climate information. Capacity building of forecasters for delivering more engaging discussions and presentations of climate information, over television and radio, could be another priority. Airing of DMH-generated climate information could also be improved, during primetime slots when maximum number of information users are tuned in to radio and television.

Researches for enhancing accuracy across forecast timescales should be pursued in collaboration with development partners. In enhancing forecast accuracy, installation of more observations stations are required, which could be supported by both the government and its development partners.

Access to DMH-generated climate information in townships and communities is generally confined to short-range forecast and warnings. More effort from DMH and partner institutions should be in place for obtaining interest of users in climate information of longer lead time. In collaboration with sectoral institutions, DMH could regularly develop risk-based information, based on 10 days, monthly and seasonal information, that could be widely shared to stakeholders.

In townships and communities, historical data is generally not accessed, albeit extremely important for guiding efforts at enhanced disaster risks management and resilience. Analysis of current and potential risks, based on historical data, can be made available for various user sectors.

To address confusion of stakeholders, over differing climate information available from multiple sources, DMH could take a lead in forging collaboration with independent/informal/unofficial/ information sources for enhancing analysis, generation, and communication of information, instead of bombarding users with divergent forecasts/warnings.

The current cyclone-centric color code, needs to be reviewed in order for the same to be fully comprehensive, rather than just capturing the location and likelihood of tropical storms/cyclones crossing the country.

2. POLICY-LEVEL DECISION-MAKERS

For enabling officials in the national, regional, district, township, and communities to undertake more proactive actions vis-à-vis multi-timescales information for better resources and risks management, policy level decision makers could focus on enhancing current national legislations, ministry regulations, and other related laws, through provision of enhanced anticipatory, pre-hazard decision-making capacities to authorities in various levels (including townships and communities) and allowing utilization of resources for pre-hazard

preparedness, for mitigation of potential impacts. Improvements in policies could facilitate the optimization of the potential for utilization of forecast of various lead times for risks management and ensuring productivity in various sectors.

3. SECTORAL INSTITUTIONS

Table 2 provides a summary of recommendations for facilitating informed DRR and resilience in key sectors. Items in bold, italic fonts applies cross-cuttingly.

Table 2. Proposed Activities in Climate-Sensitive Sectors for Enhancing Appreciation and Integration of Climate Information of Different Timescales into Plans and Decisions

Interpretation	Translation	Dissemination	Application	Feedback
Agriculture				
○ ***Identification of DMH focal team for mass media, and training for enhanced forecast delivery***		○ ***Long-range communication equipment for ensuring 24/7 receipt of information from townships to remote communities. This could include SSB and VHF radios, subject to government approval*** ○ ***Provision of sufficient number of public address systems/loudspeakers in every community, for ensuring receipt of climate information by all community respondents***		○ ***DMH focal team to regularly review feedback/ recommendations against improvements undertaken***
○ ***Identification of a team focal points in townships and communities to be trained and mandated to lead, in collaboration with relevant authorities and stakeholders, in climate application-related undertakings in townships and communities***	○ ***Identification of a team focal points in townships and communities to be trained and mandated to lead, in collaboration with relevant authorities and stakeholders, in climate application-related undertakings in townships and communities***	○ ***Identification of a team focal points in townships and communities to be trained and mandated to lead, in collaboration with relevant authorities and stakeholders, in climate application-related undertakings in townships and communities***	○ ***Identification of a team focal points in townships and communities to be trained and mandated to lead, in collaboration with relevant authorities and stakeholders, in climate application-related undertakings in townships and communities***	○ ***Identification of a team focal points in townships and communities to be trained and mandated to lead, in collaboration with relevant authorities and stakeholders, in climate application-related undertakings in townships and communities***
○ ***Training across the various functions required for effectively interpreting, translating, disseminating, and applying climate information, and sharing of experiences and recommendations for driving improvements***	○ ***Training across the various functions required for effectively interpreting, translating, disseminating, and applying climate information, and sharing of experiences and recommendations for driving improvements***	○ ***Training across the various functions required for effectively interpreting, translating, disseminating, and applying climate information, and sharing of experiences and recommendations for driving improvements***	○ ***Training across the various functions required for effectively interpreting, translating, disseminating, and applying climate information, and sharing of experiences and recommendations for driving improvements***	○ ***Training across the various functions required for effectively interpreting, translating, disseminating, and applying climate information, and sharing of experiences and recommendations for driving improvements***
○ ***Regular dialogues, through Monsoon Forums in townships and communities, for facilitating continuous learning; this will also provide platform for regular assessments of residual and emerging gaps, for guiding improvements***	○ ***Regular dialogues, through Monsoon Forums in townships and communities, for facilitating continuous learning; this will also provide platform for regular assessments of residual and emerging gaps, for guiding improvements***	○ ***Regular dialogues, through Monsoon Forums in townships and communities, for facilitating continuous learning; this will also provide platform for regular assessments of residual and emerging gaps, for guiding improvements***	○ ***Regular dialogues, through Monsoon Forums in townships and communities, for facilitating continuous learning; this will also provide platform for regular assessments of residual and emerging gaps, for guiding improvements***	○ ***Regular dialogues, through Monsoon Forums in townships and communities, for facilitating continuous learning; this will also provide platform for regular assessments of residual and emerging gaps, for guiding improvements***
○ ***Easy-to-understand***		○ ***Availability of products,***		

Table 2. Proposed Activities in Climate-Sensitive Sectors for Enhancing Appreciation and Integration of Climate Information of Different Timescales into Plans and Decisions				
Interpretation	**Translation**	**Dissemination**	**Application**	**Feedback**
information materials (pamphlets, booklets, posters, comics, and other related materials) on forecast concepts, terminologies, etc. that could be distributed to stakeholders in townships and communities. The materials could integrate/adopt symbols, illustrations, color codes, cartoons, for enhancing interest of stakeholders in user sectors and communities in the same		***from decision support system, in ethnic dialects*** ○ ***Conversion of climate information and advisories into ethnic dialects, in communities where required, prior to dissemination; focal points could be trained for this purpose***		
○ Decision support system development and customization for specific areas and priority crops integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback	○ Decision support system development and customization for specific areas and priority crops integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback	○ Decision support system development and customization for specific areas and priority crops integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback ○ ***Availability of products, from decision support system, in ethnic dialects*** ○ ***Translation of climate information and advisories into ethnic dialects, in communities where required, prior to dissemination; focal points could be trained for this purpose***	○ Decision support system development and customization for specific areas and priority crops integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback	○ Decision support system development and customization for specific areas and priority crops integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback
	○ For climate change projections/scenarios, researches can be undertaken on enhancing crop quality vis-à-vis potential future scenarios in rainfall, temperature, and extreme events	○ ***Workshops can be conducted at national to regional levels, for facilitating research initiatives; and sharing of key experiences, observations, and recommendations from demonstrations*** ○ Township and community awareness, on climate change projections, and potential implications on agriculture sector; and sharing of experiences from demonstration farms can be integrated into township and community dialogues	○ ***Integration of viable adaptation options into long-term township and community development plans*** ○ Demonstration farms for testing recommended adaptation options	
	○ ***Review and enhancements of township and community disaster preparedness SOPs, integrating sector-specific anticipatory actions, vis-à-vis different***			

Table 2. Proposed Activities in Climate-Sensitive Sectors for Enhancing Appreciation and Integration of Climate Information of Different Timescales into Plans and Decisions				
Interpretation	**Translation**	**Dissemination**	**Application**	**Feedback**
	hazard magnitudes ○ ***Testing of enhanced SOPs through preparedness exercises (i.e. orientation exercise, drill, table top, functional)***			
○ ***Training of Regional, District and Township decision-makers*** ○ Training of extension workers ○ Training of farmers	○ ***Training of Regional, District and Township decision-makers*** ○ Training of extension workers ○ Training of farmers	○ ***Training of Regional, District and Township decision-makers*** ○ Training of extension workers ○ Training of farmers ○ ***Experience sharing through Monsoon Forum platforms for facilitating potential replication of good practices, and for articulating lessons learnt and recommendations for further enhancements*** ○ ***Video and printed documentation of good practices for sharing to national, regional, district, township and community stakeholders; application of research outputs and experimental testing, can also be documented and shared***	○ ***Training of Regional, District and Township decision-makers*** ○ Training of extension workers ○ Training of farmers ○ Demonstration farms for application of climate information	○ ***Training of Regional, District and Township decision-makers*** ○ Training of extension workers ○ Training of farmers ○ ***Experience sharing through Monsoon Forum platforms for facilitating potential replication of good practices, and for articulating lessons learnt and recommendations for further enhancements***
Livestock				
○ Decision support system development and customization for specific areas and priority livestock, integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback ○ Training of township operational decision-makers ○ Training of livestock raisers	○ Decision support system development and customization for specific areas and priority livestock, integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback ○ Research on enhancing livestock resilience can be undertaken based on potential future scenarios in rainfall, temperature, and extreme events ○ Training of township operational decision-makers ○ Training of livestock raisers	○ Decision support system development and customization for specific areas and priority livestock, integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback ○ Township and community awareness, on climate change projections, and potential implications on water resources sector ○ Training of township operational decision-makers ○ Training of livestock raisers	○ Decision support system development and customization for specific areas and priority livestock integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback ○ Experimental testing of outputs of research ○ Integration of viable adaptation options into long-term township and community development plans ○ Training of township operational decision-makers ○ Training of livestock raisers ○ Demonstration areas for application of climate information	○ Decision support system development and customization for specific areas and priority livestock, integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback ○ Training of township operational decision-makers ○ Training of livestock raisers
Water Resources				
○ Decision support system	○ Decision support system	○ Decision support system	○ Decision support system	○ Decision support system

Table 2. Proposed Activities in Climate-Sensitive Sectors for Enhancing Appreciation and Integration of Climate Information of Different Timescales into Plans and Decisions				
Interpretation	**Translation**	**Dissemination**	**Application**	**Feedback**
development and customization for specific reservoirs, integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback	development and customization for specific reservoirs, integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback	development and customization for specific reservoirs, integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback	development and customization for specific reservoirs, integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback	development and customization for specific reservoirs, integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback
	○ Research on enhancing resilience and effectiveness of existing water resources facilities (reservoirs, dams, canals, etc.) vis-à-vis potential future extremes, in both rainfall and temperature	○ Township and community awareness, on climate change projections, and potential implications on water resources	○ Integration of research outputs into designs for renovation of existing water resources facilities and construction of new facilities	
	○ Research on locally feasible water resources adaptation options	○ Township and community awareness, on climate change projections, and potential implications on water resources and viable adaptation options	○ Integration of locally viable adaptation options into long-term township and community development plans	
○ Training of township operational decision-makers	○ Training of township operational decision-makers	○ Training of township operational decision-makers	○ Training of township operational decision-makers	○ Training of township operational decision-makers
○ Training of community water resources stakeholders	○ Training of community water resources stakeholders	○ Training of community water resources stakeholders	○ Training of community water resources stakeholders ○ Demonstration of application of climate information	○ Training of community water resources stakeholders
Health				
○ Decision support system for health sector, integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback	○ Decision support system for health sector, integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback	○ Decision support system for health sector, integrating and automating the functions of multi-timescales climate information interpretation, translation, dissemination, and feedback	○ Decision support system for health sector, integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback	○ Decision support system for health sector, integrating and automating the functions of climate information interpretation, translation, dissemination, and feedback
	○ Research on potential health concerns and enhancing health preparedness vis-à-vis future climate scenarios in terms of rainfall, temperature, and extremes	○ Township and community awareness, on climate change projections, and potential implications on human health	○ Integration of research outputs into medical research ○ Integration of research outputs into long-term township and community development plans	
○ Training of township operational decision-makers, and health providers	○ Training of township operational decision-makers, and health provider	○ Training of township operational decision-makers, and health providers	○ Training of township operational decision-makers, and health providers	○ Training of township operational decision-makers, and health providers
Energy				
○ Decision support system for energy sector, integrating and automating the functions of climate information interpretation, translation,	○ Decision support system for energy sector, integrating and automating the functions of climate information interpretation, translation,	○ Decision support system for energy sector, integrating and automating the functions of multi-timescales climate information interpretation,	○ Decision support system for energy sector, integrating and automating the functions of climate information interpretation, translation,	○ Decision support system for energy sector, integrating and automating the functions of climate information interpretation, translation,

Table 2. Proposed Activities in Climate-Sensitive Sectors for Enhancing Appreciation and Integration of Climate Information of Different Timescales into Plans and Decisions				
Interpretation	**Translation**	**Dissemination**	**Application**	**Feedback**
dissemination, and feedback	dissemination, and feedback	translation, dissemination, and feedback	dissemination, and feedback	dissemination, and feedback
	○ Research on impacts on energy consumption and generation vis-à-vis future climate scenarios in terms of rainfall, temperature and extremes	○ Township and community awareness, on climate change projections, and potential implications on energy consumptions and	○ Integration of research outputs into enhancements of existing energy generation facilities, and designs of future ones ○ Integration of research outputs into building/infrastructure designs ○ Integration of research outputs into long-term township and community development plans	
○ Training of township operational decision-makers	○ Training of township operational decision-makers	○ Training of township operational decision-makers	○ Training of township operational decision-makers	○ Training of township operational decision-makers
Disaster Risk Management				
○ Decision support system for disaster risk management sector, integrating and automating the functions of climate information interpretation, translation, dissemination, and sending of feedback, upon inputs of stakeholders	○ Decision support system for energy sector, integrating and automating the functions of climate information interpretation, translation, dissemination, and sending of feedback, upon inputs of stakeholders ○ Research on potential future stresses on humans, assets and resources vis-à-vis future climate scenarios in terms of rainfall, temperature and extremes	○ Decision support system for energy sector, integrating and automating the functions of multi-timescales climate information interpretation, translation, dissemination, and sending of feedback, upon inputs of stakeholders ○ Township and community awareness, on climate change projections, and potential implications in disaster risk management	○ Decision support system for energy sector, integrating and automating the functions of climate information interpretation, translation, dissemination, and sending of feedback, upon inputs of stakeholders ○ Integration of research outputs into enhancements of SOPs in disaster risk management ○ Integration of research outputs into building/infrastructure designs ○ Integration of research outputs into long-term township and community development plans	○ Decision support system for energy sector, integrating and automating the functions of climate information interpretation, translation, dissemination, and sending of feedback, upon inputs of stakeholders
○ Training of township operational decision-makers and community stakeholders	○ Training of township operational decision-makers and community stakeholders	○ Training of township operational decision-makers and community stakeholders	○ Training of township operational decision-makers and community stakeholders	○ Training of township operational decision-makers and community stakeholders
Local Governments				
○ Integrated platform for decision support systems for different sectors ○ Training in townships and Communities	○ Integrated platform for decision support systems for different sectors ○ Training in townships and communities	○ Integrated platform for decision support systems for different sectors ○ Training in townships and communities	○ Integrated platform for decision support systems for different sectors ○ Climate Information Application Training in townships and communities ○ Development planning training in townships and communities	○ Integrated platform for decision support systems for different sectors ○ Training in townships and communities

Table 2. Proposed Activities in Climate-Sensitive Sectors for Enhancing Appreciation and Integration of Climate Information of Different Timescales into Plans and Decisions				
Interpretation	**Translation**	**Dissemination**	**Application**	**Feedback**
○ Regular assessments of capacities and gaps in township and communities	○ Regular assessment of capacities and gaps in township and communities	○ Regular assessment of capacities and gaps in township and communities	○ Regular assessment of capacities and gaps in township and communities	○ Regular assessment of capacities and gaps in township and communities

Items in bold, italic fonts apply across sectors

It has to be acknowledged that better access to climate information, particularly in communities, is highly connected to improved basic facilities like electricity, roads, and telecommunications. Efforts at enhancing receipt, understanding, analysis and application of climate information, should also be completed by the availability of facilities that support safety like identified evacuation routes, evacuation shelters, etc. Environmental protection, to minimize impacts of hazards in areas-at-risk, should be undertaken. Specifically, reforestation, mangrove aquaculture, and others relevant can be pursued. Summarizing the recommendations, a multi-pronged capacity development is proposed, as a roadmap vis-à-vis climate information for decision-making (Figure 23).

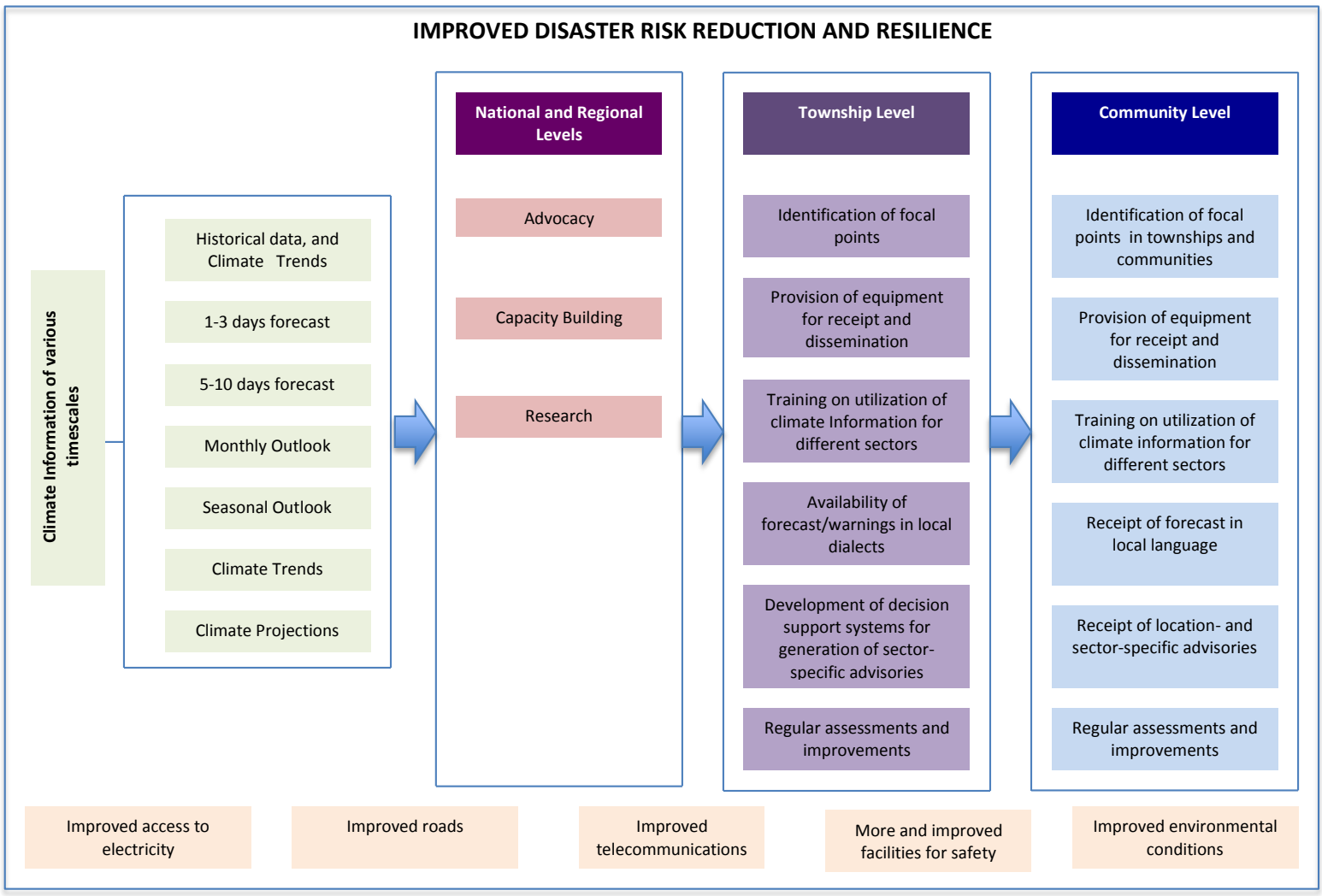

Figure 23. Multi-pronged capacity building for improved disaster risk reduction and resilience

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