Training on Forecast Interpretation, Translation and Communication

Activity Report

9-11 October 2013, Colombo, Sri Lanka

The Training on Forecast Interpretation, Translation and Communication was convened by the Department of Meteorology, Sri Lanka, as part of the project "Reducing risks of tsunamis, storm surges, large waves, and other natural hazards in low elevation coastal zones", supported by the United Nations Economic and Social Commission for Asia and the Pacific through the Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and Southeast Asian Countries.

1 Introduction

Effective forecast application for managing resources and reducing disaster risks requires a process of understanding and transforming forecast information into a form that is relevant to users. This process is constrained by the mismatch between the scientific nature of forecasts and the non-scientific background of forecast users. In Sri Lanka, user demands for easy-to-understand information products and capacity to interpret and translate them for application in decision-making have been articulated since the 4th Monsoon Forum in 2011.

1.1 Training Objectives

In response to user demands, the Training on Forecast Interpretation, Translation, and Communication was held from 9-11 October 2013 at DOM Auditorium in Colombo, Sri Lanka. Specifically, the training aimed to build capacity of participants to:

a) Understand the science behind hazards
b) Understand the science behind forecast generation
c) Appreciate the process of forecast generation
d) Be aware of forecast products available in the country, including associated uncertainties
e) Evaluate how these products could be useful, in view of hazard-sensitive activities and decision context
f) Apply products in identifying potential impacts to systems that could be at risk
g) Identify options to manage these potential impacts, and
h) Identify ways for closer collaboration between forecast/information providers – the Department of Meteorology (DOM), Department of Irrigation (DOI), Geological Survey and Mines Bureau (GSMB), and National Building Research Organization (NBRO) – and forecast user institutions.

1.2 Structure

The training program was divided into modules (M) and sessions (S), as follows:

Table 1. Forecast Translation Training Outline
M1: Weather and Climate
M1S1: Weather and Climate Dynamics
M1S2: Weather and Climate Forecasts: Generation, Interpretation, and Communication
M2: Floods
M2S1: Floods in Sri Lanka
M2S2: Flood Forecasts and Warnings: Generation, Interpretation, and Communication
M3: Landslides
M3S1: Landslides in Sri Lanka
M2S2: Landslide Forecasts and Warnings: Generation, Interpretation, and Communication
M4: Forecast Translation
M4S1: Understanding Probabilities
M4S2: Translating Forecasts into Impact Outlook and Response Options
M5: Other Hazards: Earthquake and Tsunami
M5S1: Earthquake and Tsunami
M5S2: Earthquake Information Products: Generation, Interpretation, and Communication

M5S3: Tsunami Information Products: Generation, Interpretation, and Communication

M6: Communicating Risks

M6S1: Risk Communication

1.3 Participants

A total of 41 trainees from more than 27 government and non-government organizations, listed below, participated in the training:

- DOM
- DOI
- Department of Agriculture
- Hector Kobbekaduwa Agrarian Research and Training Institute
- Rubber Research Institute Sri Lanka (RRISL)
- Sugarcane Research Institute
- Tea Research Institute
- Department of Forest (DOF)
- Department of Fisheries and Aquatic Resources (DFAR)
- Central Environment Authority (CEA)
- Coast Conservation Department (CCD)
- National Aquatic Resources Research and Development Agency (NARA)
- Mahaweli Authority Sri Lanka (MASL)
- National Water Supply and Drainage Board
- Ceylon Electricity Board (CEB)
- Asian Aviation Center Ratmalana
- Sri Lanka Navy
- National Center for Lightning Safety
- Disaster Management Center (DMC)
- District Disaster Management Committee, Kalutara
- District Disaster Management Committee, Ampara
- Local Government of Beruwala
- Local Government of Kalutara
- Local Government of Pottuvil
- Police Department
- Institute of Policy Studies (IPS)
- Media outlets

1.4 Resources

Resource persons for the training were from DOM, DOI, GSMB, NBRO, and RIMES.

The training employed the following methodologies:

- Presentations
- Interactive discussions
- Case study analysis
- Practical exercises

2 Highlights of the Training

2.1 Opening Session

The training was opened with the singing of the National Anthem and lighting of the oil lamp.

Mr. S.H. Kariyawasam, Director General, DOM, delivered the welcome address. He highlighted DOM's various forecast products, with the monthly forecast as the latest product, which is shared to stakeholders on experimental basis since January 2013. He noted the need for users to interpret and translate these products for effective application; hence, this Training on Forecast Interpretation, Translation, and Communication.

Ms. Ruby Rose Policarpio, Institutional Development Specialist, RIMES, provided a rationale for the training: RIMES' prior work in Asia revealed lack of users' understanding of forecasts and the absence of mechanism for converting forecasts into sector-specific operational language and management strategies. She cited the 1997-1998 severe El Niño, for which forecast of up to six (6) months lead time was available. Climate-sensitive sectors did not use the information for developing mitigation strategies, resulting to tremendous economic losses, particularly in the agriculture sector. She then facilitated participant introductions and expectations, and introduced the objectives, scope, and methods of the training.

2.2 Module 1: Weather and Climate

M1S1: Weather and Climate Dynamics. Mr. Siri Ranjith Jayasekera of DOM introduced the climate setting of Sri Lanka, which included weather and climate processes and drivers, seasonal characteristics, extreme events and their impacts, observed trends, and climate projections.

M1S2: Weather and Climate Forecasts – Generation, Interpretation, and Communication. Mr. Jayasekera and Ms. Anusha Warnasooriya of DOM presented DOM's forecast information products at different time scales and their uses; inputs, models, and the complex process used in their generation; and uncertainty associated with these products. Participants were given orientation on terminologies, symbols, and color codes used in these products.

Importance of seamless forecasts was emphasized, i.e. the use of forecasts of different timescales. Seasonal climate outlook has higher uncertainty, hence could be used in planning. Medium- and shorter-term forecasts have lower uncertainty compared to the seasonal outlook; hence could complement, for application in contingency planning and livelihoods decisions. Two- to three-day forecasts have the lowest uncertainty.

The session also covered BMD's dissemination system, highlighting the institutional arrangement, redundant channels of communication, as well as communication of uncertainty.

2.3 Module 2: Floods

M2S1: Floods in Sri Lanka. DOI presented the country's flood profile, classification of floods affecting Sri Lanka, flood-prone areas in the country, long-term flood frequency, and significant flood events and their impacts.

M2S2: Flood Forecasts and Warnings – Generation, Interpretation and Communication. This session included presentations on and discussion of the process of generation of water level/ flood forecasts, from DOI's water level monitoring system, collection and transmission of station data, process of analysis, models used in flood forecasting, model output evaluation, up to issuance of forecast. Participants were given orientation on available flood forecast products at different timescales, definition of terminologies used, and threshold levels employed for flood warning.

Uncertainty in flood forecasts was explained: uncertainties in weather forecast input and in hydrological and hydrodynamic models, and inadequate observation data all contribute to flood forecast uncertainty. The session also covered the dissemination system for minor and major floods.

2.4 Module 3: Landslides

M3S1: Landslides in Sri Lanka. Mr. R.M.S. Bandara of NBRO presented and discussed the various factors/triggers of landslides, classification of landslides affecting the country, landslide-prone areas, long-term landslide frequency, and significant landslide events and their impacts.

M3S2: Landslide Forecasts and Warnings – Generation, Interpretation and Communication. This session covered rainfall monitoring system in landslide-prone areas, transmission of rainfall observations to NBRO headquarters, integration of data into NBRO's landslide model to generate landside forecasts/ warnings, standard operating procedure for warning generation and dissemination, and warning dissemination through redundant systems. Participants were given orientation on available landslide forecast/ warning products, definition of terminologies used, uncertainties in forecasts and warnings, and the use of updated forecasts/ warnings to reduce uncertainty.

2.5 Module 4: Forecast Translation

M4S1: Understanding Probabilities. This session introduced the concept of probability of exceedance or the likelihood of a certain climate parameter being exceeded, on the average, in a defined period. The session put emphasis on interpretation of historical data and constructing plausible inferences based on forecast and historical observation data.

An exercise was facilitated to aid participant understanding of the concept. Participants were grouped into 4 and tasked to analyze the potential rainfall for October 2013 in Batticaloa, Anuradnapura, Colombo, and Badulla, given the district-wise rainfall data for October from 1961-1990 (Figure 1), 30-year rainfall variability for the given districts (Figures 2 to 5), and probability of exceedance and rainfall forecast for these areas. The following questions were provided to guide the anlaysis:

- Based on historical data, what could be the potential minimum rainfall for October 2013 and the probability of the October 2013 rainfall to be at least or exceeding the same?
- Based on historical data and the forecast[1], what could be the potential maximum rainfall for October 2013? Based on the probability of exceedance, what is the chance of getting the said potential maximum rainfall for October 2013?
- What is the potential range of rainfall that could be received in October 2013 per your analysis of historical data, the forecast, and probability of exceedance?

[1] DOM's rainfall forecast for October indicates the probability of below normal rainfall for the country. Normal rainfall means ± 10% of the average rainfall value; above normal means more than 10% above the average rainfall value; and below normal means more than 10% below the average rainfall value.

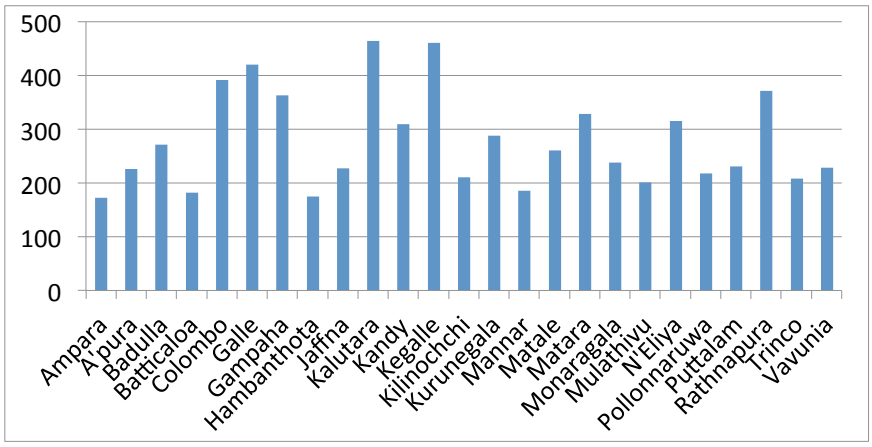

Figure 1. District-wise average rainfall (mm) for October, from 1961 to 1990

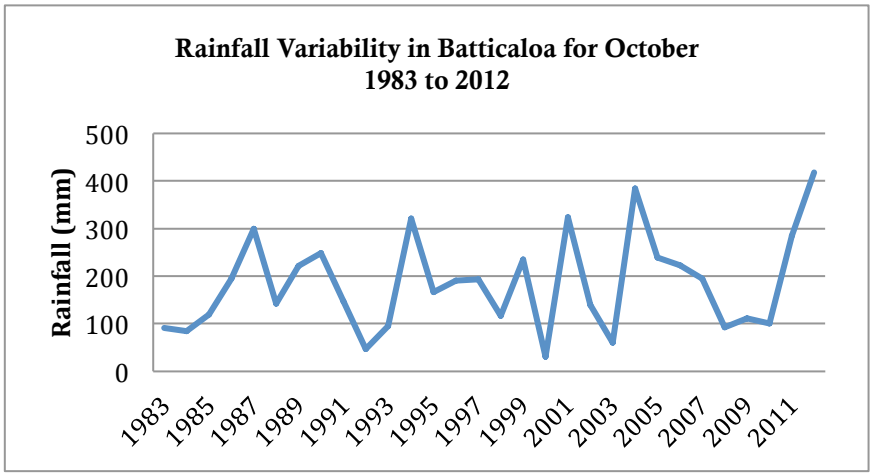

Figure 2. 30-year rainfall variability in Batticaloa for October

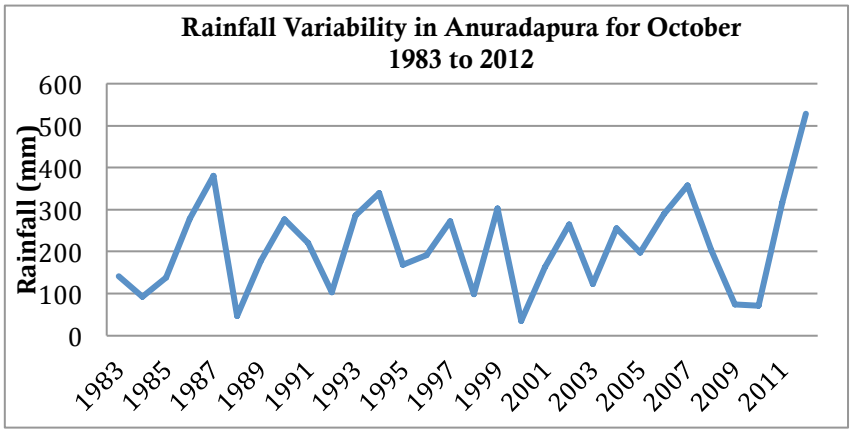

Figure 3. 30-year rainfall variability for Anuradapura for October

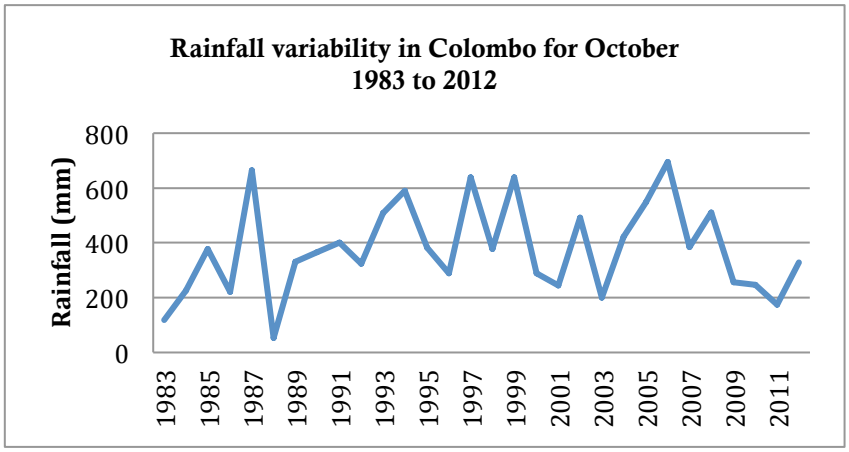

Figure 4. 30-year rainfall variability in Colombo for October

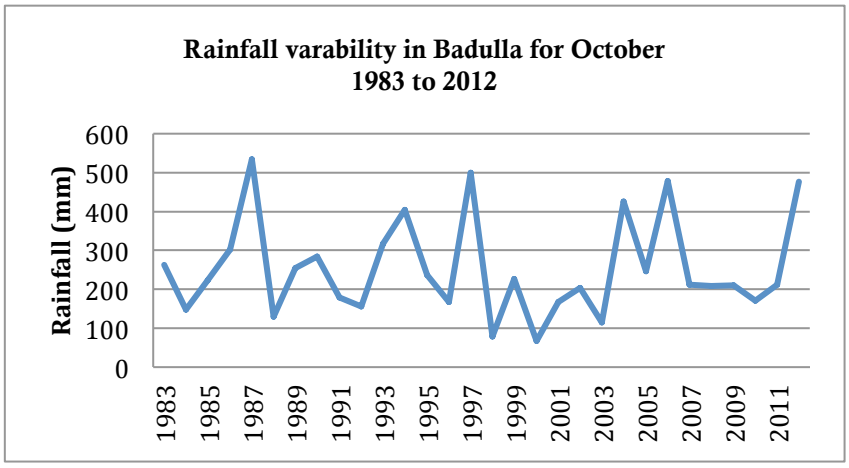

Figure 5. 30-year rainfall variability in Badulla for October

Table 2 presents the group outputs from the exercise.

Table 2. Group outputs on potential rainfall analysis, based on long-term rainfall data, probability of exceedance, and forecast
Group 1: Batticaloa Potential minimum rainfall for October 2013: 30 mm Probability of October 2013 rainfall to be at least or exceeding the least rainfall amount per record: 100% Average rainfall for the area: 182mm Potential maximum rainfall for October 2013 based on historical data and forecast: 163.8 mm Chance of getting the potential maximum rainfall based on probability of exceedance: 55% Potential range of rainfall for October 2013: 30mm to 163.8 mm

Table 2. Group outputs on potential rainfall analysis, based on long-term rainfall data, probability of exceedance, and forecast
Group 2: Anuradapura Potential minimum rainfall for October 2013: 35 mm Probability of October 2013 rainfall to be at least or exceeding the least rainfall amount per record: 100% Average rainfall for the area: 226 mm Potential maximum rainfall for October 2013 based on historical data and forecast: 203 mm Chance of getting the potential maximum rainfall based on probability of exceedance: 50% Potential range of rainfall for October 2013: 35 mm to 203 mm
Group 3: Colombo Potential minimum rainfall for October 2013: 53 mm Probability of October 2013 rainfall to be at least or exceeding the least rainfall amount per record: 100% Average rainfall for the area: 392 mm Potential maximum rainfall for October 2013 based on historical data and forecast: 353 mm Chance of getting the potential maximum rainfall based on probability of exceedance: 55% Potential range of rainfall for October 2013: 53 mm to 353 mm
Group 4: Badulla Potential minimum rainfall for October 2013: 80 mm Probability of October 2013 rainfall to be at least or exceeding the least rainfall amount per record: 100% Average rainfall for the area: 253 mm Potential maximum rainfall for October 2013 based on historical data and forecast: 228 mm Chance of getting the potential maximum rainfall based on probability of exceedance: 50% Potential range of rainfall for October 2013: 80 mm to 228 mm

M4S2: Translating Forecasts into Impact Outlook and Response Options. This session provided tools for transforming forecasts into impact outlook and management strategies/measures for application. An exercise grouped participants based on the sectors they represent (disaster risk management, power generation and distribution, water resources and fisheries, and agriculture, irrigation, and plantation/research institutions), and facilitated their analysis of forecast-based potential impacts and response options. Outputs from each group were then presented in the plenary.

The following table provides the group outputs.

Group 1. Disaster Risk Management						
Activity	**Forecast**	**Location**	**Elements-at-risk**	**Potential Impact**	**Capacities**	**Response**
Flood management	Seasonal Forecast for the Northeast monsoon season Monthly Forecast for October 2013 Note: though forecast is below normal for the Northeast monsoon season and for October 2013, there could be episodes of heavy rainfall for the season/month and flood-prone areas could be affected	Anuradhapura Town	• Residents in low elevation areas • Crops • Inland fisheries • Drainage, roads, reservoirs, and other infrastructures	• Potable water scarcity • Insufficient food • Adverse impacts on health • Adverse impacts on livelihoods	• VDMC committees/ forces • Active government institutions	• Irrigation management • Search and rescue team preparedness • Relief and health service preparedness • Camp management preparedness
Drought management		Whole district	• Water availability • Crops and other vegetation • Health	• Lack of drinking water • Water scarcity for various purposes • Human-elephant conflict • Forest fires • Adverse impact on agriculture • Shortage of food • Impact on wildlife	• VDMC • Availability of hospitals in the area • Organized fire brigade • Water board in the area • Irrigation department in the area	• Irrigation management • Search and rescue team preparedness • Relief and health service preparedness • Camp management preparedness • Water management

Group 2. Water Resources/Fisheries						
Activity	**Forecast**	**Location**	**Elements-at-risk**	**Potential Impact**	**Capacities**	**Response**
Coastal fisheries	Daily Forecast – Strong Rainfall and Wind	Batticaloa	• Boats and accessories • Lives of fishermen • Fishing gears	• Fatalities • Damages to boats and accessories • Degradation of fish production and social status	• Established institutions for early warning/ response	• Dissemination of information to fisher community • Awareness for safety and related issues • Provision of life jackets • Provision of life buoys/rings, etc.

Group 3. Agriculture, Irrigation, and Plantation / Research Institutions						
Activity	**Forecast**	**Location**	**Elements-at-risk**	**Potential Impact**	**Capacities**	**Response**
Paddy cultivation	Seasonal and Monthly – Below Normal for October Below Normal for the rest of the Season	Anuradhapura	• Paddy	• Lower paddy production	• Reservoirs and tanks • Diversion system • Crop diversification system • Machineries/ manpower • Well-established Farmers' Organization (FO) system	• Increase in planting of other field crops (OFC) • Decrease planting of paddy • More water diversion from Mahaweli system • Plant short-duration varieties; drought tolerant varieties • Low water-use paddy cultivation like the System of Rice Intensification (SRI) method
Livestock/ Livelihoods			• Livestock • Inland fisheries	• Salinity increase • Lower production	• Machineries and manpower	• Short maturing species
Farming labor			• Human health/ well-being	• Adverse impact on workforce		
Other income-generating activities			• Tourism	• Impact on national economy		
Perennial crop cultivation			• Production	• Lowering of ground water table • Impact on household food security	• Well-established FO system	• More water diversion from Mahaweli System • Use of drought tolerant varieties • Use of short-duration varieties

Group 4. Power Generation and Distribution						
Activity	**Forecast**	**Location**	**Elements-at-risk**	**Potential Impact**	**Capacities**	**Response**
Power generation and distribution	Seasonal and Monthly forecast Below normal for October Below normal for the rest of the season	Colombo	• Uninterrupted electricity supply	• Dryer than average weather is likely to lead to increase in electricity demand	• Thermal power availability • Self-generation scheme	• Awareness of consumers • Increased usage of thermal power • Demand-side management • Promotion of self-generation scheme • Optimize maintenance programmes

2.6 Module 5: Other Hazards – Earthquake and Tsunami

M5S1: Earthquake and Tsunami. This session sensitized participants on the earthquake and tsunami risks in the country. The session covered earthquake triggers, Sri Lanka's seismicity, earthquake and tsunami-prone areas, and historical earthquake and tsunami events and their impacts.

M5S2: Earthquake Information Products – Generation, Interpretation, and Communication. This session familiarized participants on GSMB's 24/7 earthquake monitoring system, which consists of remote stations established by IRIS and GEOFON and linked to GSMB, virtual network at GSMB that is linked to the global seismic network, data acquisition and analysis system, and standard operating procedure (SOP) for earthquake bulletin generation and dissemination. The session also assisted participants in interpreting earthquake magnitude and intensity.

M5S3: Tsunami Information Products – Generation, Interpretation, and Communication. This session presented and discussed DOM's tsunami warning system, which include SOP for warning generation based on analysis of earthquake magnitude and epicenter and on information from regional tsunami warning centers, information products, and dissemination. The session also aided participants in the interpretation of tsunami bulletins. The session stressed that tsunami threat in Sri Lanka comes from regional earthquake sources, hence lead time for warning is about 1.5 to 2 hours from earthquake occurrence.

2.7 Module 6: Communicating Risks

M6S1: Risk Communication. The session discussed the basics of risk communication and design of risk communication materials. Case studies allowed participants to learn from documented experiences. A facilitated exercise assisted participants in the design of risk communication materials.

2.7 Closing Session

DOM requested key participants to provide their feedback about the training, as part of the closing session. These include:

- Participants commented that they had better understanding of forecast/warning information terminologies and concepts, which would benefit their careers.
- The training built participants' capacities to analyze forecasts
- A participant from the media stated that he now has better knowledge of the topics and hence could improve article writing about forecasts/risk management and provide better messages to the audience
- The training should be replicated, to accommodate more sectoral stakeholders, for better application

Details of participant evaluation are provided in the Annex.

Mr. Jayasekera delivered the vote of thanks, while Mr. Kariyawasam delivered the closing remarks. The latter committed to present the participants' recommendations at the Monsoon Forum.

3 Training Outcomes and Recommendations

All 41 participants from agriculture, fisheries, water resource, environment, transport, power, and disaster management sectors, including the media, completed the training. The training provided yet another venue for forecast provider and user interaction toward usable forecasts and actionable warnings. All participants were appreciative of the relevance of the training to their work. Annex 1 provides the feedback received from participant evaluation.

Participants provided the following recommendations for future trainings:

- Include other hazards, such as storm surge
- Exercises could also include the process of rainfall prediction and the use of forecasting models
- Include more video presentations, especially on case studies of previous disasters, like tsunami
- Increase the size of visual aids
- Include field visits
- Target other decision-makers at subnational and local levels, including communities
- Obtain post-training feedback from participants, through participant reports
- Longer training program
- Regular and more frequent conduct of the training to reach more users

Annex: Training Evaluation

The training was evaluated based on participants' assessment of:

a) Degree to which training objective was met
b) Relevance of topics covered
c) Contents of the training
d) Time allotted for the sessions
e) Usefulness of the materials provided
f) Knowledge, competence, clarity, and level of engagement of trainers/resource persons
g) Benefits of the training

The following figures present the evaluation[2] results:

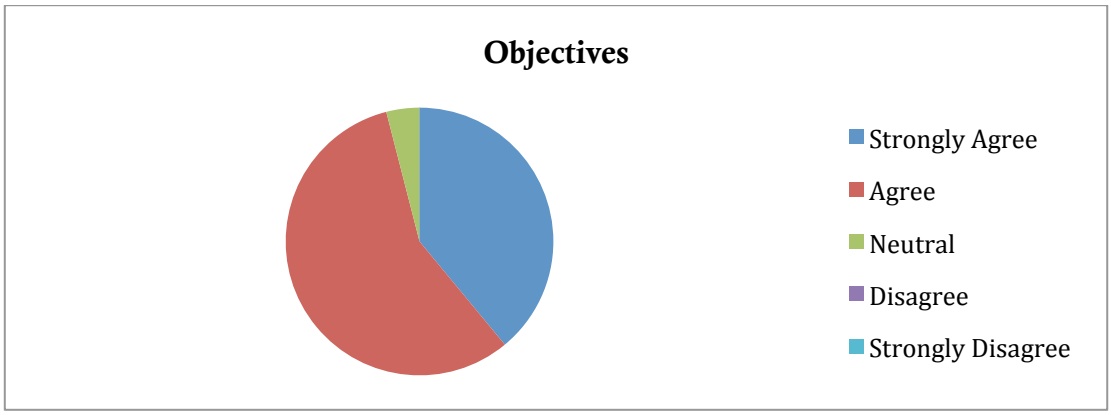

Figure 6. About 96% of participants agreed that the training objectives were met

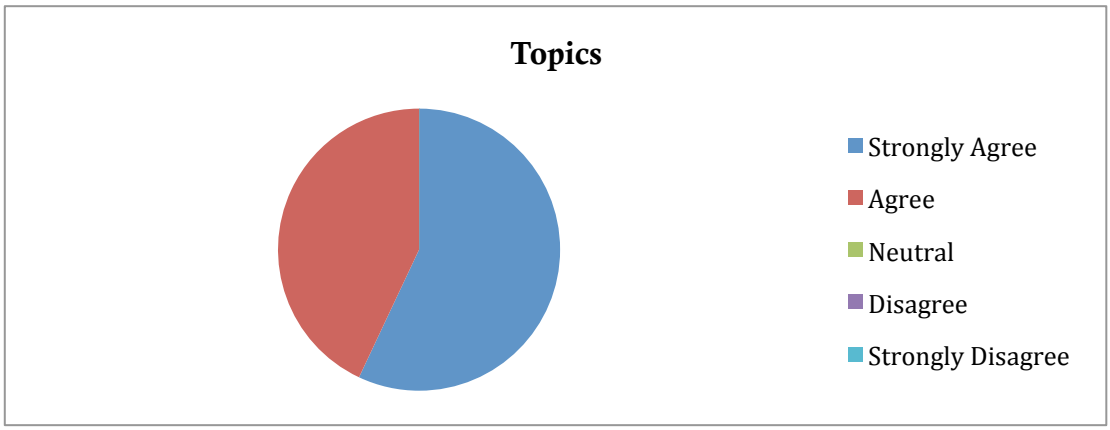

Figure 7. All participants agreed that the topics were relevant

[2] Presentation of percentages is based on 28 filled-up up evaluation forms received.

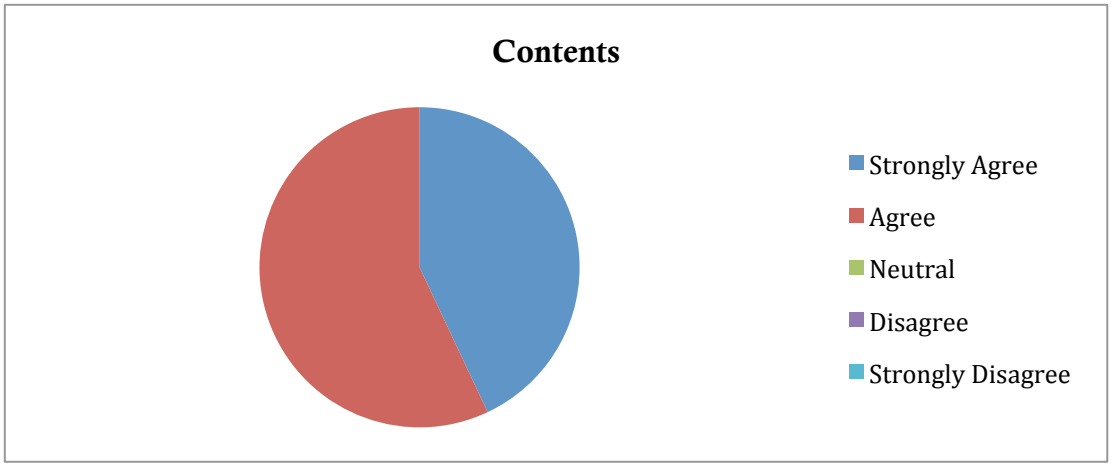

Figure 8. All participants agreed that the contents were well organized and easy to follow

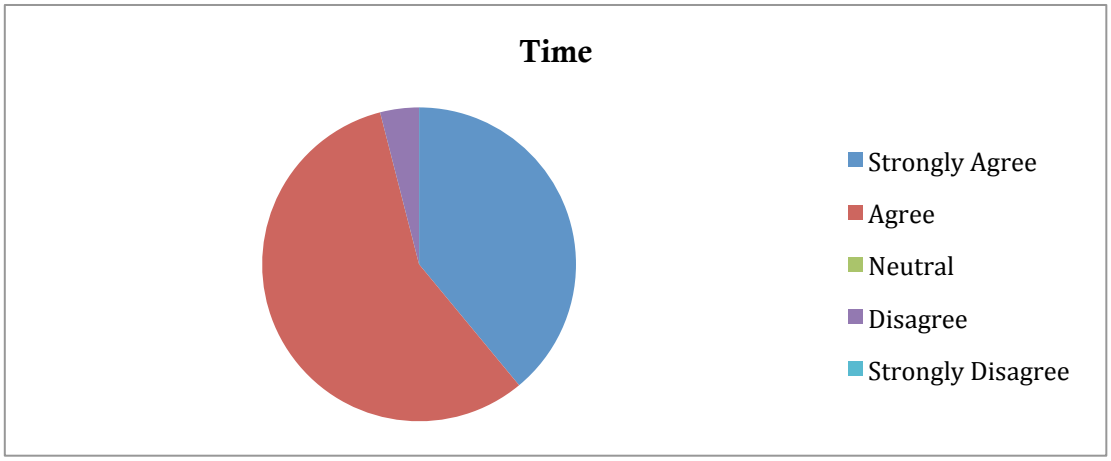

Figure 9. About 96% of the participants agreed that time allotted for the sessions, discussions, and exercises was sufficient

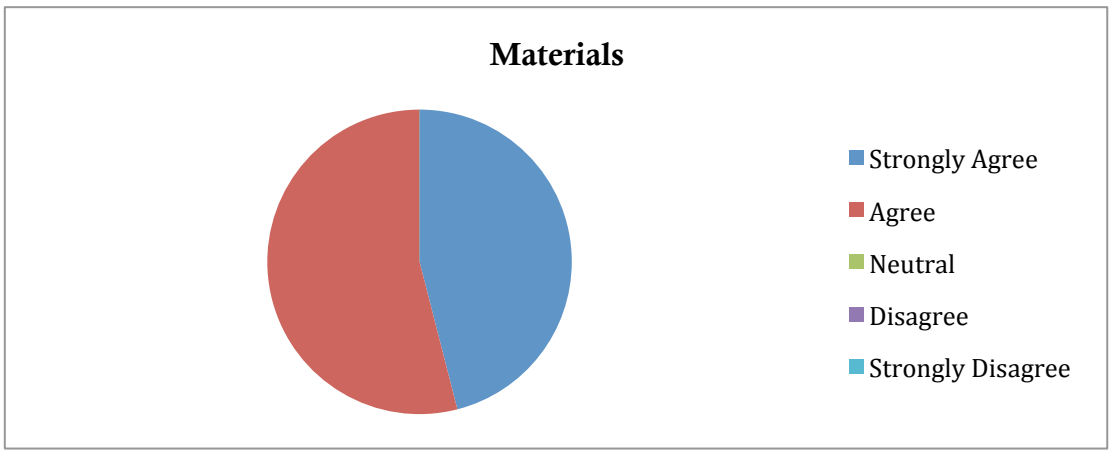

Figure 10. All participants found the materials helpful and easy to read

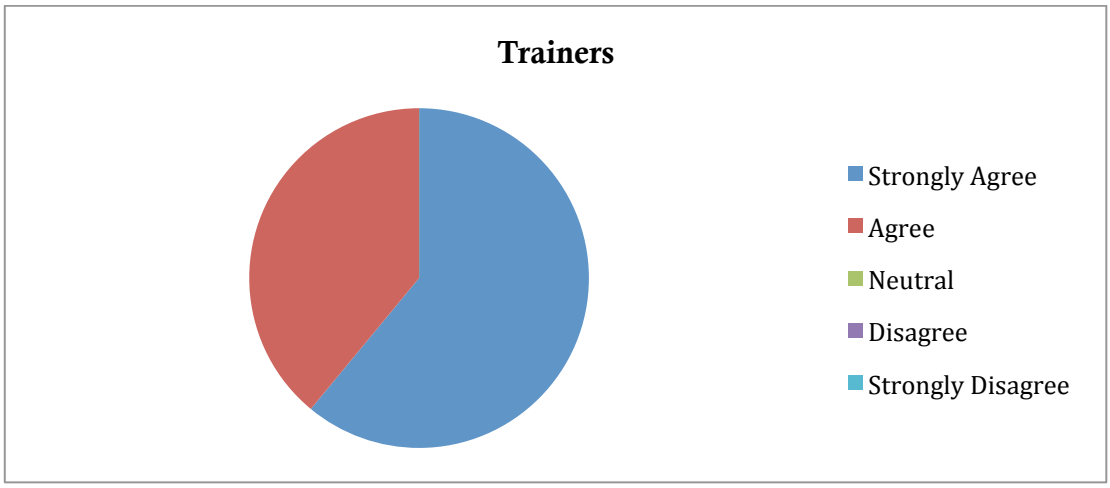

Figure 11. All participants found the trainers knowledgeable, competent, clear, and had high level of engagement with the participants in the discussions

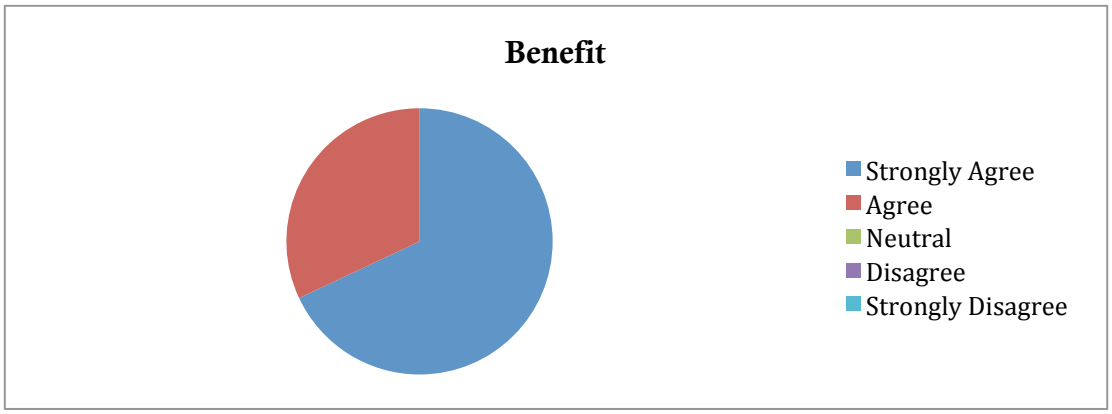

Figure 12. All participants agreed that the training benefited them and their institutions

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