



Regional Integrated Multi-Hazard
Early Warning System



Department of Meteorology- Sri Lanka



United Nations Economic and Social Commission
for Asia and the Pacific


7th MONSOON FORUM



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ACTIVITY REPORT

30 APRIL 2013
COLOMBO, **SRI LANKA**



The 7th Monsoon Forum, in Sri Lanka, was convened by the Department of Meteorology (DOM), as part of the programme “*Reducing risks of tsunamis, storm surges, large waves, and other natural hazards in low-elevation coastal zones*” with support from the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) and the Regional Integrated Multi-Hazard Early Warning System (RIMES).

Section 1

INTRODUCTION



1.1 Background

The Monsoon Forum, a platform for enhanced application of forecast application, provides opportunity for regular dialogue between Sri Lanka's Department of Meteorology (DOM) and its stakeholder institutions to promote a) enhanced understanding, by forecast user institutions, of forecast products including their limitations and uncertainties; and b) better appreciation, by DMH, of users' information requirements. The process facilitates a cycle of refinement of forecast products to suit users' needs and development of more robust information sharing system, redounding to better application of forecasts.

Built on the monsoon, a regular phenomena in the country, the Monsoon Forum has taken a multi-hazard approach by May 2012, integrating issues on forecasts/warning information and other concerns regarding geological hazards like earthquakes and tsunamis.

The 7th Monsoon Forum is organized by DOM with support from the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) and the Regional Integrated Multi-Hazard Early Warning System (RIMES) through the project "Reducing risks of tsunamis, storm surges, large waves, and other natural hazards in low elevation coastal zones".

1.2 Objectives

The 7th Monsoon Forum, convened on 30 April 2013 at DOM Auditorium, Colombo, Sri Lanka, was with the following objectives:

- a) review the 2012-2013 Northeast Monsoon in terms of patterns of climate and performance of the seasonal climate
- b) draw feedback from user institutions on the relevance/usability of the seasonal forecast for the Northeast Monsoon and recommendations for enhancement of forecast products
- c) present the seasonal forecast for the Southwest Monsoon
- d) present sectoral potential impacts outlook and response options for possible application by stakeholders
- e) present/discuss recent issues/concerns/developments in earthquake monitoring and tsunami early warning and response

1.3. Agenda

The 7thth Monsoon Forum agenda is presented below:

Agenda		
8.30 – 9.00	Arrival and registration of participants	DOM
Session 1: Opening/Inaugural Session		
9.00-9.05	National Anthem	
9.05-9.10	Lighting of the Oil Lamp	

9.10-9.20	Welcome/Opening Remarks	Mr. S.H. Kariyawasam Director General DOM
9.20-9.30	Message	Ms. S. Marina Mohamed Secretary Ministry of Disaster Management
9.30-9.40	Introduction of participants	To be facilitated by DOM
9.40-9.50	Coffee/Tea Break	
Session 2: Overview of the Monsoon Forum Process		
9.50 – 10.00	Summary of Discussions and Recommendations during the 6 th Monsoon Forum	RIMES/DOM
Session 3: Verification of the Long Range Forecast for the Northeast Monsoon Season		
10.00-10.20	Verification of Seasonal Forecast for the Northeast Monsoon Season	DOM
10.20-10.50	Discussion/Feedback from User Institutions on: <ul style="list-style-type: none"> 1) Relevance/Usability of Forecast for the Northeast Monsoon Season 2) Experiences, Management Decisions and Lessons Learnt during the Northeast Monsoon Season 	<ul style="list-style-type: none"> • Agriculture • Plantation • Disaster Management • Irrigation and Water Management • Pilot site representatives
Session 4: Seasonal Climate Outlook for the Southwest Monsoon Season		
10.50-11.10	Presentation of Seasonal Climate Outlook for the Southwest Monsoon Season	DOM
11.10-11.20	Discussion	
Session 5: Group Discussion: Sectoral Potential Impacts Outlook and Response Options		
11.20-12.00	Working Group Discussion: Development of Potential Impacts Outlook and Response Options	Facilitation: DOM/RIMES
12.00-12.20	Presentation of Outputs and Discussion	
Session 6: Issues and Concerns on Tsunami Preparedness		
12.20-12.30	Updates on the Tsunami Risk Assessment Project	DMC
12.30-12.40	Discussion	
Session 7: Way Forward and Closing Session		
12.40-12.50	Synthesis, Vote of Thanks, and Closing Remarks	DOM

1.4 Participants

The 7th Monsoon Forum was attended by 36 participants from government institutions, UN/international development organizations, and research, business and media entities. These include:

Government Institutions

- Central Environmental Authority (CEA)
- Civil Aviation Authority of Sri Lanka (CAASL)
- Coast Conservation Department (CCD)
- Department of Agriculture (DOA)
- Department of Export Agriculture (DEA)
- Department of Fisheries and Aquatic Resources (DFAR)
- Department of Forest (DOF)
- Department of Irrigation (DOI)
- District Disaster Management Coordination Unit (DDMCU), Kalutara
- DDMCU, Pottuvil
- Disaster Management Center (DMC)
- Mahaweli Authority of Sri Lanka (MASL)
- Ministry of Health (MOH)
- National Aquatic Resources Research and Development Agency (NARA)
- National Building and Research Organization (NBRO)
- National Water Supply and Drainage Board (NWSDB)
- Rubber Research Institute of Sri Lanka (RRISL)
- Sri Lanka Navy (SLN)

UN/International Development Organizations

- Food and Agriculture Organization of the United Nations (FAO)

Academe/Research Center

- Sugarcane Research Institute (SRI)
- Institute of Policy Studies (IPS)
- Coconut Research Institute (CRI)
- Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI)

Media

- Sri FM

Business/Enterprise Entities

- Cargills (Ceylon) PLC

Section 2

OPENING SESSION



2.1 Welcome and Opening Remarks

Mr. Lalith Chandrapala of DOM welcomed the participants to the 7th Monsoon Forum. He espoused that the Monsoon Forum was established in Sri Lanka, by DOM, to facilitate very good relationship between DOM and forecast user institutions. Mr. Chandrapala elaborated that among the specific objectives of the Forum is to review the previous season, in terms of patterns of climate and forecast performance, obtain feedback from stakeholders on the behavior of the past season and usability of forecast, and provide forecast to different sectors for the subsequent season.

According to Mr. Chandrapala, the Southwest Monsoon is the lifeblood of the Sri Lankan economy because most sectors are dependent on rainfall from Southwest monsoon.

He explained that forecasts are not 100% accurate and elaborated that forecasting is still a developing science. Climate scientists, according to Mr. Chandrapala, discuss predictions from international/regional climate centers and come up with a consensus.

He proceeded to thank UNESCAP and RIMES for the facilitating the Monsoon Forum process in Sri Lanka.

2.2 Remarks

On behalf of RIMES, Ms. Ruby Rose Policarpio, Institutional Development Specialist, thanked DOM for its commitment of bridging science to its stakeholders. She underscored that gaps in the application of forecasts/warning information abound in countries because of the scientific nature of forecasts and the limitations, on the part of the users, in understanding forecasts.

Building on what was espoused by Mr. Chandrapala, Ms. Policarpio indicated that forecasts are always accompanied by limitations and uncertainties. The general rule in forecasting, she continued, is that the longer the lead time, the higher the uncertainty. Hence, forecasts of different timescales should be used for different purposes. The seasonal forecast, for example, is best used for planning and should be supplemented with shorter-term forecast products.

She elaborated that over the course of the Monsoon Forum process, DOM did its best in responding to demands and recommendations from stakeholders. She highlighted that since January 2013, DOM had begun issuing 3-monthly and monthly forecasts to support its seasonal forecasts. This development was anchored on the recommendations from stakeholders during the 6th Monsoon Forum.

She expressed her hope that the 7th Monsoon Forum would be useful for both DOM and its stakeholders.

2.3 Introduction of participants

DOM facilitated the introduction of participants.

2.4 Summary of Recommendations during the 9th Monsoon Forum

Ms. Policarpio presented the summary of discussions and recommendations during the 6th Monsoon Forum. She indicated that the session was intended for participants to recall the discussions, agreements, and recommendations during the 6th Monsoon Forum. She also encouraged participants to follow-up on such agreements/recommendations during the discussions that will follow the different sessions.

She recalled that the 6th Monsoon Forum was conducted on 8 November 2012 at the Ministry of Disaster Management Auditorium, Colombo, Sri Lanka and was supported by UNESCAP and RIMES.

She elaborated on the objectives of the 6th Monsoon Forum, which included:

- review of the 2012 Southwest Monsoon in terms of patterns of climate and performance of the seasonal climate forecast
- draw feedback from user institutions on the relevance/usability of the seasonal forecast for the monsoon season and recommendations for enhancement of forecast products
- present seasonal forecast for the dry season
- discuss and present sectoral impacts outlook and response options for potential application
- present/discuss recent issues/concerns/developments in earthquake monitoring/tsunami early warning and response
- draw recommendations from stakeholder-institutions in improving the conduct of subsequent Monsoon Forums

Subsequently, Ms. Policarpio expounded on the key sessions during the 6th Monsoon Forum, as follows:

- verification of the long-range/seasonal forecast for the Southwest Monsoon Season
- feedback from user-institutions on the relevance/usability of seasonal forecast for the Southwest monsoon season and sharing of experiences, management decisions, and lessons learnt during the Southwest monsoon season
- presentation of the seasonal climate outlook for the Northeast Monsoon Season
- development and presentation of potential impacts outlook and response options
- lessons learnt from the 11 April 2012 tsunami warning and response: outcomes from post-warning survey conducted by Disaster Management Center

Focus was then provided on the recommendations, from the participants, during the 6th Monsoon Forum. These recommendations are provided below:

- **Enhanced spatial and temporal resolution of forecasts**
The seasonal forecast for the Northeast Monsoon Season, indicated by DOM district-wise, was appreciated by the stakeholders. It was recommended though to adapt agro-climatic zones in localizing/customizing forecasts.
- **Provision of seasonal forecast updates to stakeholders**
DOM and stakeholder institutions agreed that in case of changes in the climate trend for the season in the region, updates should be sent to institutions by email, SMS and other

mechanisms. DOM was also encouraged to provide forecast updates for subsequent months.

Updates and/or forecasts for the subsequent season could include the following information, among others, to maximize usefulness:

- onset of seasonal rainfall
- mid-season dry spell
- mid-season above normal rainfall
- withdrawal of seasonal rainfall
- above-normal ambient temperature

DOM is also looking into publishing the seasonal forecast into its website.

- **Enhanced delivery of forecast products**

A mechanism to ensure receipt of forecasts by extension personnel in the plantation and other sectors should be put in place.

- **Enhanced awareness and uptake of forecast information**

It was suggested that DOM, in collaboration with RRISL, visit rubber planters to explain about forecast products.

DOA recommended that an Agro-meteorological Advisory Service (AAS) should be established through the collaboration of DOM and DOA. Agricultural advisories, in farmers' language, could be generated and disseminated by DOA based on forecasts issued by DOM.

The AAS Cell should be established, composed of a team of scientists and extension agronomists, within DOA. The AAS should be directly linked to the National Meteorological Center (NMC) of DOM.

The process of forecast receipt, and development and dissemination of agro-advisories by DOA, was detailed and captured below:

- Short and medium-range forecasts issued by NMC should be directly provided to AAS; forecasts should be area-specific.
- Preparation of agricultural advisories by the AAS Cell
- Dissemination of agro-advisories to farmers through a) farm broadcasting service; b) online agricultural extension service; c) cyber extension service; d) printed and electronic media; e) SMS alert system

- **Enhanced conduct of the Monsoon Forum**

While highly appreciated as very useful to stakeholder sectors, it was recommended that subsequent monsoon forums be conducted in:

- mid- to late-April in anticipation of the Southwest Monsoon Season
- mid-to late October in anticipation of the Northeast Monsoon Season

- **Enhanced awareness on disaster risk reduction/management**

It was recommended that disaster risk reduction/management should be introduced as part of the school curriculum, so that awareness transcends all levels and sectors in the country.

- **Enhanced understanding of people's responses to tsunami warning information**

Stakeholders recommended that more surveys assessing people's responses to tsunami warning should be conducted in order to obtain a representative population of the country's coastal residents. Responses, or the differences thereof, among men and women should also be assessed.

Section 3

VERIFICATION OF THE NORTHEAST MONSOON SEASON FORECAST



3.1 Verification of the Long Range Climate Forecast for the Northeast Monsoon Season

Ms. Anusha Warnasooriya of DOM commenced the session delivery by discussing the climate seasons in Sri Lanka, as presented in Table 1.

Table 1. Climate seasons in Sri Lanka	
First Intermonsoon	March to April
Southwest Monsoon	May to September
Second Intermonsoon	October to November
Northeast Monsoon	December to February

According to Ms. Warnasooriya, normal annual rainfall values in different parts of the country, shown in Figure 1, is averaged at 479 mm, with higher rainfall in the country's eastern slopes.

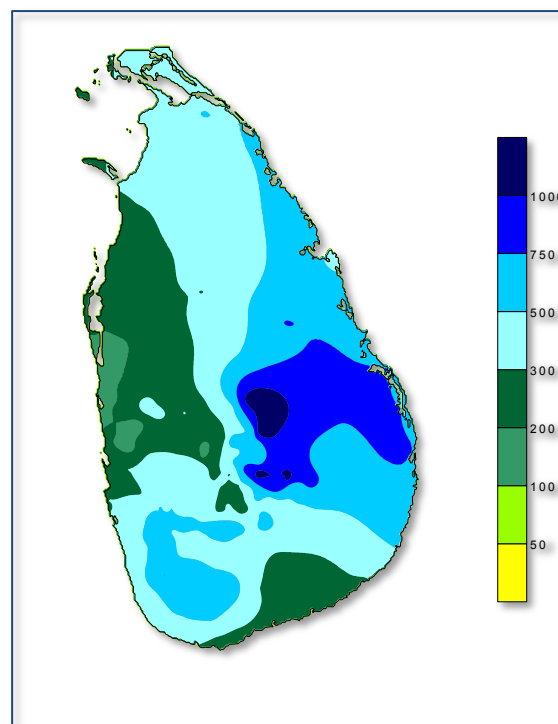


Figure 1. Long-term normal rainfall values in different parts of Sri Lanka indicating higher rainfall received in the Eastern part of the country

Ms. Warnasooriya proceeded to explain that the seasonal forecast, for November 2012 to January 2013, was generated through the analysis of dynamical model outputs of international and regional climate centers. According to her, most of the model outputs point to El Nino Southern Oscillation (ENSO)-neutral and Indian Ocean Dipole (IOD)-neutral conditions for November 2012 to January 2013, summarized in Table 2. The summary of model outputs suggests higher probability of normal/above normal rainfall. Based on analysis of the said outputs, DOM issued

the long-range forecast for the period indicating likelihood of normal to slightly above normal rainfall.

WMO-LRF Multi-Model Ensemble	NCEP CFS-2	JMA	EUROSIP	ECMWF	CPT SST Model	CPT U850 Model	Summary
AN	AN	N	No Signal	AN	N/BN	AN/N	BN/N/AN 15/45/40
N: Normal AN: Above Normal BN: Below Normal							

Verification of seasonal forecast was subsequently discussed. In November, according to Ms. Warnasooriya, below normal rainfall was observed in Southwest coastal areas, Northwest and Northern areas and some parts of the Eastern province. On the other hand, above normal rainfall was observed in Anuradapura, Badulla, Bandarawela, Batticaloa, Hambantota, Katugastota, Nuwara Eliya, Ratnapura, Polonnaruwa, and Monaragala. Comparison, between normal and observed rainfall values in main stations in the country, for November 2012, is shown in Figure 2. In Figure 3, DOM data indicates that except in Laxapana, Kothmale and Ukuwela, all hydro-catchment stations recorded below normal rainfall in November 2012.

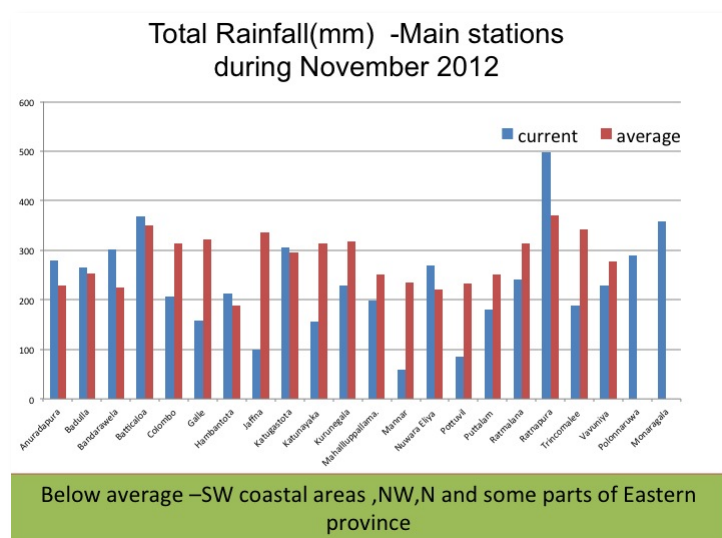


Figure 2. Comparison between normal and observed normal rainfall values in key observations stations in Sri Lanka in November 2012

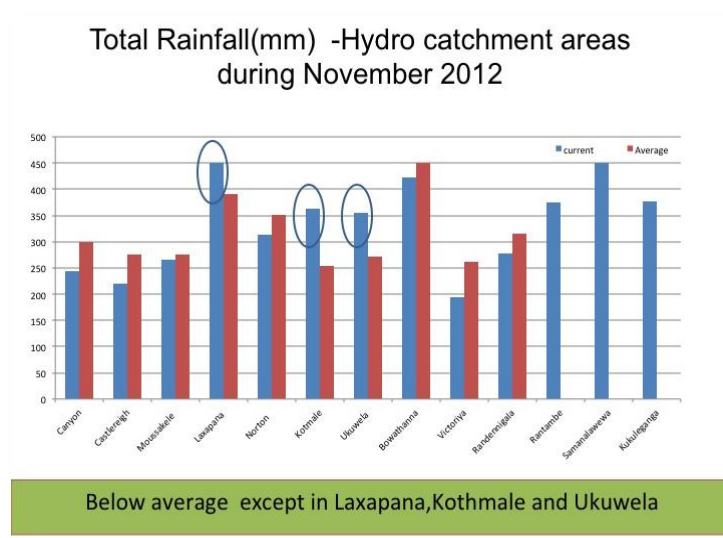


Figure 3. Normal against observed rainfall values, in November 2012, in hydro-catchment areas

On the other hand, Figures 4 to 7 provide comparison between monthly normal and observed rainfall values in main stations and hydro-catchment areas from December 2012 to January 2013.

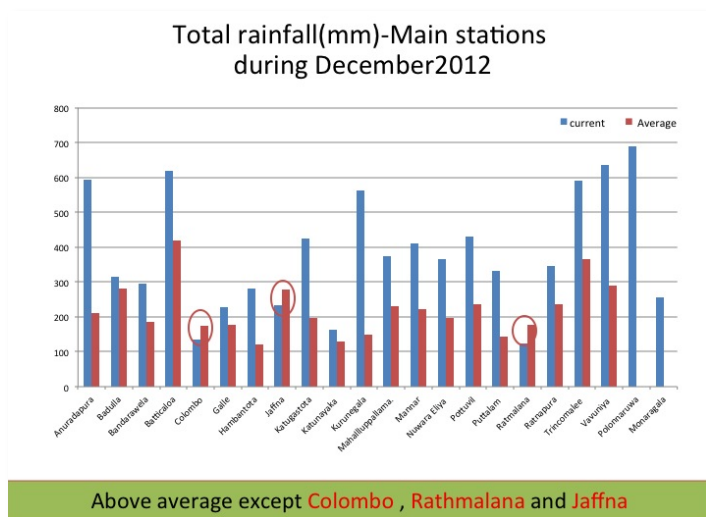


Figure 4. Normal rainfall values for December against observed rainfall values for December 2012 in different main stations in Sri Lanka

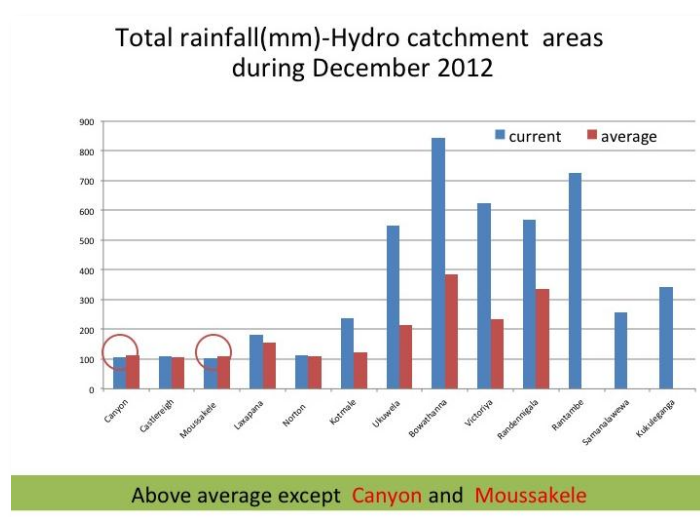


Figure 5. Comparison between long-term normal rainfall values for December and observed rainfall values for December 2012 in different hydro-catchment areas in the country

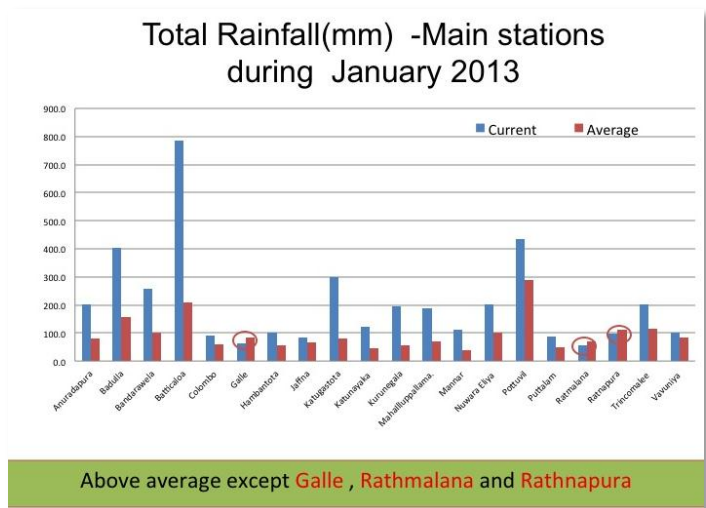


Figure 6. Long-term normal rainfall values, for January, in key observation stations in the country is compared to observed rainfall values, for January 2013, in the same stations.

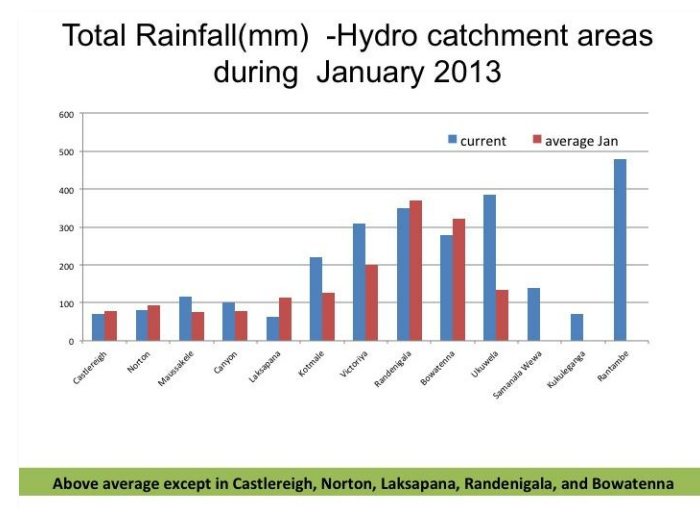


Figure 7. Comparison between normal rainfall values for January and observed rainfall values for January 2013 in hydro-catchment stations in Sri Lanka.

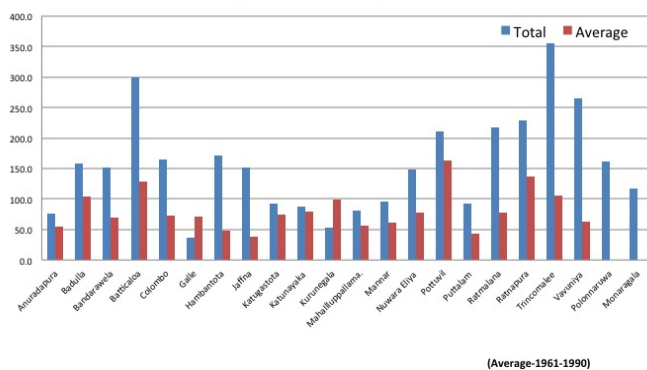
Comparison, between station-wise normal and observed accumulated rainfall values, from November 2012 to January 2013, indicated that all the main stations recorded above normal accumulated rainfall from November 2012 to January 2013 except in four stations, viz., Colombo, Galle, Katunayaka, and Ratmalana. Percentage of departure from normal, during the period, is indicated in Table 3.

Table 3. Departure from normal of observed rainfall values in different stations in Sri Lanka, from November 2012 to January 2013

Percentages of Total rainfall(mm)-Main stations during NDJ 2012- 2013 (from Nov 2012 to Jan 2013)			
Station	Current	Average(61-90)	% (percentage)
Anuradapura	1075.8	519.8	207
Badulla	983.4	689.7	143
Bandarawela	853.5	512.9	166
Batticaloa	1773.8	978.4	181
Colombo	433.2	547.9	79
Galle	450.53	583	77
Hambantota	594.1	363.7	163
Jaffna	418	681.4	61
Katugastota	1030.9	570.7	181
Katunayaka	444.2	489.2	91
Kurunegala	986.3	524	188
Mahalluppallama.	760.7	550.2	138
Mannar	581.1	494.9	117
Nuwara Eliya	837.4	518.3	162
Pottuvil	948.7	757.5	125
Puttalam	599.8	443.1	135
Ratmalana	418.7	561.8	75
Ratnapura	939.1	717.8	131
Trincomalee	979	823	119
Vavuniya	964.7	652	148
Polonnaruwa	1368.3	NA	NA
Monaragala	897.7	NA	NA

Moreover, by February 2013, above-normal rainfall was recorded in all stations in the country, except in Galle and Kurunegala (Figure 8). In catchment areas in the same month, most stations received above normal rainfall with the exception of Kotmale, Randenigala, Bowatenna, and Ukuwela (Figure 9). Recorded number of rainy days was above normal, for all stations, during the month (Figure 10). In Table 4, departure from normal rainfall and number of rainy days, for February, are indicated.

Rainfall(mm) -Main stations
during February 2013



Rainfall(mm) -Catchment areas
during February 2013

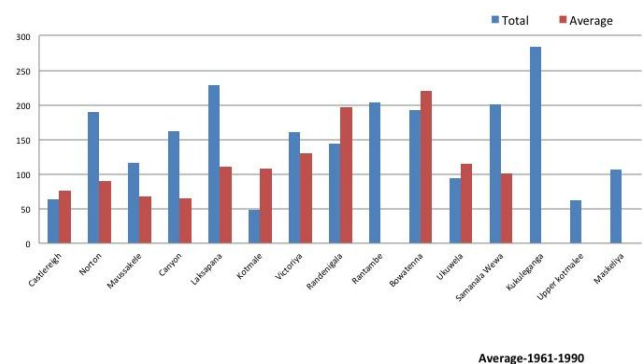


Figure 8. In February 2013, above normal rainfall was recorded in all key stations n Sri Lanka except in Galle and Kurunegala

Figure 9. Above normal rainfall, in most catchment areas in the country, was recorded in February 2013

No of Rainy Days -Main stations during February 2013

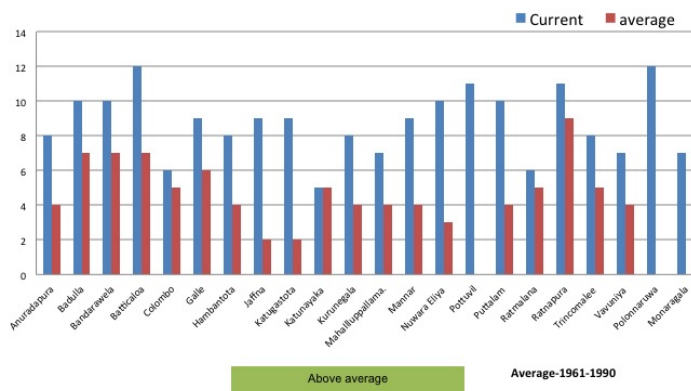


Figure xx. Observed number rainy days for February 2012 in comparison with normal number of rainy days for February

Table 4. Departure from normal rainfall and number of rainy days for February 2013

Percentages of Rainfall and No of Rainy days -Main stations during February 2013

	Rainfall(mm)			No of Rainy days		
	Current	Average	%(percentage)	Current	average	%(percentage)
Anuradapura	75.9	55.4	137	8	4	200
Badulla	158.7	103.1	154	10	7	143
Bandarawela	151.3	70.2	216	10	7	143
Batticaloa	300.0	128.4	234	12	7	171
Colombo	164.3	72.7	226	6	5	120
Galle	37.0	70.5	52	9	6	150
Hambantota	171.3	47.6	360	8	4	200
Jaffna	150.8	39.0	387	9	2	450
Katugastota	91.9	74.2	124	9	2	450
Katunayaka	88.2	79.8	111	5	5	100
Kurunegala	52.9	98.8	54	8	4	200
Mahalluppallama.	81.0	56.8	143	7	4	175
Mannar	95.8	61.8	155	9	4	225
Nuwara Eliya	148.7	77.7	191	10	3	333
Pottuvil	210.4	163.6	129	11	NA	NA
Puttalam	93.0	43.1	216	10	4	250
Ratmalana	217.7	77.3	282	6	5	120
Ratnapura	228.3	137.0	167	11	9	122
Trincomalee	355.2	105.4	337	8	5	160
Vavuniya	264.4	62.5	423	7	4	175
Polonnaruwa	161.6	NA	NA	12	NA	NA
Monaragala	117.0	NA	NA	7	NA	NA

Average-1961-1990

Finally, comparison between normal and observed accumulated rainfall values in main stations, from November 2012 to February 2013 indicated above normal rainfall in all main stations, except in Galle, shown in Figure 11. Similarly, stations in hydro-catchment areas recorded above normal rainfall for the season with the exception of Castlereigh and Moussakele, illustrated in Figure 12.

Table 5 presents the departure from normal rainfall values of observed rainfall for the season in main observation stations in the country. The highest positive variation from normal was recorded in Kurunegala.

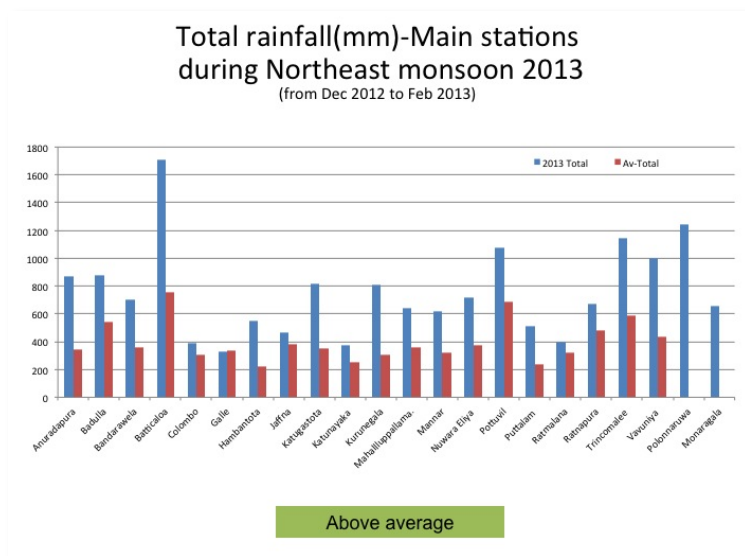


Figure 11. Comparison between long-term normal rainfall values for the Northeast monsoon season and observed values for the 2012-2013 season

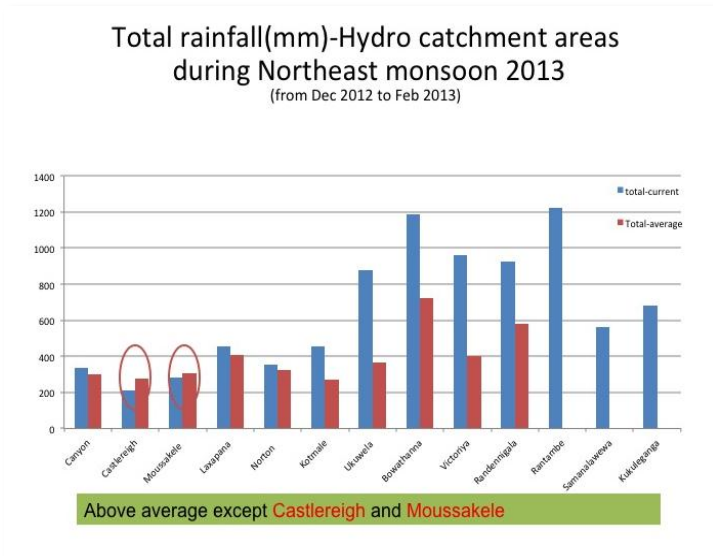


Figure 12. Normal rainfall values for the Northeast monsoon season in hydro-catchment areas against observed rainfall values for the season

Table 5. Departure from normal rainfall, in main stations in Sri Lanka, from November 2012 to February 2013

Percentages of Total rainfall(mm)-Main stations during North-East monsoon 2012- 2013 (Dec,Jan,and Feb)			
Station	Current	Average(61-90)	% (percentage)
Anuradapura	873	345.5	253
Badulla	876.4	539.8	162
Bandarawela	703.3	358.8	196
Batticaloa	1706.2	757.2	225
Colombo	390	306.2	127
Galle	330.9	332.5	100
Hambantota	552.3	223.8	247
Jaffna	469.4	384.3	122
Katugastota	816.2	349.3	234
Katunayaka	375.4	255.3	147
Kurunegala	811.2	304.2	267
Mahalluppallama.	642.8	356.6	180
Mannar	618.9	321.7	192
Nuwara Eliya	716.9	374.3	192
Pottuvil	1074.8	689.1	156
Puttalam	511.9	235.9	217
Ratmalana	396.1	324.4	122
Ratnapura	670.5	483.4	139
Trincomalee	1145.2	585.5	196
Vavuniya	999.9	436.3	229
Polonnaruwa	1239.8	NA	NA
Monaragala	655	NA	NA

3.2 Discussion/Feedback from User Institutions on Relevance/Usability of Forecast for the Winter Season and Recommendations for Enhancement of Forecast Products

3.2.1 DOA

Presented by Dr. B.V.R. Punyawardena, Climatologist, DOA, the presentation revolved on DOA's access to seasonal forecast for the 2012-2013 Northeast monsoon season, how the forecast was utilized for the season, and recommendations on improving forecast application.

Dr. Punyawardena reported the following:

Experiences and Lessons Learnt of DOA During the 2012-2013 Northeast Monsoon Season	
Awareness of DOM's seasonal forecast for the 2012-2013 Northeast monsoon season	Yes, DOA was aware of the forecast; the institution was represented during the 6 th Monsoon Forum
Understanding of seasonal forecast	Yes, the forecast was easily understood
Usability of seasonal forecast, for the 2012-2013 Northeast monsoon season	Yes, DOA was able to use the seasonal forecast. Its usability was, however, limited as the resolution was coarse (not region-specific)
Relevance of forecast to DOA for planning and decision-making	Yes, the forecast was very relevant, as agriculture is a main stakeholder of climate information
Decisions undertaken by DOA in anticipation of possible impacts as well as harness potential of the predicted climate condition for the Northeast monsoon season	Decisions undertaken included, among others: <ul style="list-style-type: none">• When to start planting• What age-classes and varieties of crops could be used
Institutional experiences in implementing decisions based on seasonal forecast	Lack of region-wise forecast made it difficult to take appropriate and strong decisions
Challenges/issues met in implementing decisions based on forecast	Decision-making is impeded by the lack of region-specific forecast
Good practices during the past season	Good practices, in the agriculture sector, included: <ul style="list-style-type: none">• Preparedness of authorities to provide appropriate seed materials and other inputs in time• Readiness of provincial staff with correct/appropriate extension program
Lessons learnt	<ul style="list-style-type: none">• Decision-making is limited because of coarse forecast resolution, hence finer spatial resolution of

	forecast is needed
Recommendations	<ul style="list-style-type: none"> • Finer forecast resolution based on agro-climatic zones • Updating of seasonal forecast, mid-season

Dr. Punyawardena indicated that during the past season, DOA had very good opportunity for preparedness, especially in providing seeds and other inputs to farmers. Extension workers were also made aware of the anticipated condition for the Northeast monsoon season, with emphasis that it would be a good season for agriculture. He also underscored the confidence of DOA to share the information from DOM to agriculture extension workers. He further indicated that even the tanks have very good storage during the season.

According to Dr. Punyawardena, the agriculture sector is the biggest client of DOM and DOA has a good communication mechanism with DOM. He elaborated that once forecast is obtained from DOM, the same is translated into farmers' language and disseminated. He also underscored that while DOA requires forecasts at very fine resolution, DOM may not be able to provide the same, in the immediate future, due to a variety of circumstances and that reality is understood by DOA. Considering the limitations, it would be good if DOM could provide at least agro-climatic zone-specific forecast. DOA, continued Mr. Punyawardena, is usually convening a meeting prior to every panting season, hence having guidance on potential agro-climatic condition for the season, as well as rainfall onset, among others, would be very useful for the agriculture sector.

3.2.2 RRISL

RRISL experiences and lessons learnt, during the 2012-13 Northeast monsoon season, was shared during the 7th Monsoon Forum by Ms. Wasana Wijesuriya, Principal Research Officer (Biometry). A summary of her presentation is provided below:

Experiences and Lessons Learnt of RRISL During the 2012-2013 Northeast Monsoon Season	
Awareness of DOM's seasonal forecast for the 2012-2013 Northeast monsoon season	Yes, RRISL was aware of the seasonal forecast, from DOM, for the November 2012 – February 2013 season; RRISL was represented during the 6 th Monsoon Forum
Understanding of seasonal forecast	Yes, the forecast was easily understood
Usability of forecast, for the 2012-2013 Northeast monsoon season	<p>Yes, RRISL was able to utilize the forecast. However, the 5th and 6th Monsoon Forums did not provide enough/ideal lead time (5th Monsoon Forum was conducted in 22 May 2012; 6th Monsoon Forum conducted in 8 November 2012) for RRISL to fully use the forecast.</p> <p>The 7th Monsoon Forum is conducted at a better time, in response to recommendations from stakeholders in</p>

	<p>previous Monsoon Forums to conduct the same at earlier dates, to provide enough lead time for forecast application among stakeholders</p>
<p>Relevance of forecast for planning and decision-making</p>	<p>Yes, the forecast was very relevant, as rubber planting season in the Intermediate Zone coincides with Northeast monsoon season.</p> <p>Smallholder farmers receives planting materials from the Rubber Development Department every season. The usual timeframe for distribution of planting materials is within October to November. For the 2012-2013 Northeast monsoon season, the distribution of planting materials was extended to January 2013 because of anticipated sufficient rainfall.</p> <p>During the season, February is also a critical month for rubber planting in the Intermediate Zone as sufficient rainfall during the month is expected to ensure successful survival/establishment of rubber plants.</p> <p>RRISL also built on measures on soil moisture conservation in the area during the 2012-2013 season.</p>
<p>Decisions undertaken in anticipation of possible impacts as well as harness potential of the predicted climate condition for the 2012-2013 Northeast monsoon season</p>	<p>Some of the decisions undertaken were:</p> <ul style="list-style-type: none"> • Improvement in the adoption of appropriate soil and moisture conservation measures • Improvement of drainage system to minimize adverse impacts of water logging • Extension of distribution of rubber planting materials until January 2013 to take advantage of anticipated rainfall • Soil moisture conservation measures implementation • Provision of recommendations, to those who requested information, on appropriate soil conservation/mitigation measures in water-logged areas
<p>Institutional experiences in implementing decisions based on seasonal forecast</p>	<p>Due to the limited lead time for forecast utilization subsequent to the 6th Monsoon Forum, it was not possible to do planned awareness program for stakeholders in the rubber plantation sector.</p> <p>Those, however, who requested assistance were made aware of appropriate recommendations on soil and moisture conservation/mitigation measures in water-logged areas.</p>
<p>Challenges/issues met in implementing decisions based on forecast</p>	<p>There was high demand for rubber seedlings, hence some farmers were not able to avail of planting materials at the beginning of the season. Some farmers</p>

	<p>were only able to plant rubber by January 2013.</p> <p>Rubber planting dates are difficult to change/move, in many occasions, except in the estate sector as those in this sector have their own nurseries.</p>								
Lessons learnt	<p>There is difficulty in changing rubber planting dates, for most of the planters, except those in the estate sector as they have their own nurseries.</p>								
Recommendations	<p>Ms. Wijesurya summarized some key recommendations made during the 6th Monsoon Forum and also provided the progress of DOM in addressing the same:</p> <table border="1"> <thead> <tr> <th>Recommendations during the 6th Monsoon Forum</th><th>Status</th></tr> </thead> <tbody> <tr> <td>Conduct the Forum for the Southwest Monsoon Season in April</td><td>Implemented</td></tr> <tr> <td>Forecast to be updated and sent to stakeholders via email</td><td>Implemented; RRISL was able to receive monthly forecasts from January to April 2013 from Ms. Shiromani of DOM</td></tr> <tr> <td>Build awareness among extension personnel/estate management in the plantation sector</td><td>Not yet implemented. Follow-up was made on whether DOM would be able to address the proposed building of awareness among extension personnel and estate managers on the seasonal forecast</td></tr> </tbody> </table> <p>She also followed-up on the recommendation during the 6th Monsoon Forum that dissemination of forecast updates, using sms, should be considered, if possible.</p> <p>Enhanced collaboration between DOM, the plantation sector, and other institutions could be enhanced according to Ms. Wijesurya.</p> <p>Ms. Wijesuriya further recommended that in providing monthly updated forecasts, the observed rainfall values for the previous month be indicated so that users can better anticipate the rainfall condition for the coming month. This suggestion is illustrated in Figure 13.</p>	Recommendations during the 6 th Monsoon Forum	Status	Conduct the Forum for the Southwest Monsoon Season in April	Implemented	Forecast to be updated and sent to stakeholders via email	Implemented; RRISL was able to receive monthly forecasts from January to April 2013 from Ms. Shiromani of DOM	Build awareness among extension personnel/estate management in the plantation sector	Not yet implemented. Follow-up was made on whether DOM would be able to address the proposed building of awareness among extension personnel and estate managers on the seasonal forecast
Recommendations during the 6 th Monsoon Forum	Status								
Conduct the Forum for the Southwest Monsoon Season in April	Implemented								
Forecast to be updated and sent to stakeholders via email	Implemented; RRISL was able to receive monthly forecasts from January to April 2013 from Ms. Shiromani of DOM								
Build awareness among extension personnel/estate management in the plantation sector	Not yet implemented. Follow-up was made on whether DOM would be able to address the proposed building of awareness among extension personnel and estate managers on the seasonal forecast								

District	Average rainfall (mm) -February	Probability %			Rainfall received in January 2013
		Below	Normal	Above	
Anuradapura	84.6	13	30	57	
Badulla	232.3	15	30	55	
Batticaloa	194.3	17	29	54	

Can we have this column filled

Figure 13. As proposed by RRISL, observed rainfall for the previous month could be indicated in providing the monthly forecast for subsequent month, to serve as reference for stakeholders to better anticipate forecast rainfall.

Proposed future collaboration, between DOM, RRISL and other institutions, on data/information sharing was elaborated. This proposal is indicated in Figure 14.

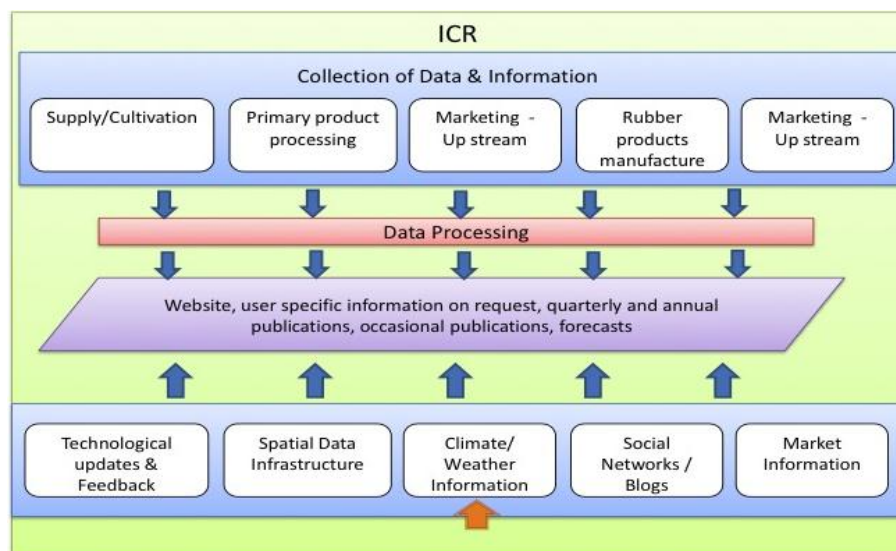


Figure 14. Proposed framework for data/information sharing between DOM, RRISL, and other institutions.

3.2.3 DMC

For and on behalf of DMC, Mr. Pradeep Kodippili, Assistant Director, delivered the presentation. In his presentation, Mr. Kodippili highlighted that the seasonal forecast, from DOM, for the 2012-2013 Northeast monsoon season was fully understood. He recalled that the forecast indicated normal to above normal rainfall, for the country, during the season.

Mr. Kodippili highlighted some of the most intense rainfall events in the country during the season. According to him, in 16 December 2012, 145.6mm of rainfall was recorded in Karunegala. The following day, 17 December 2012, the same station recorded 315.5 mm of rainfall, a record in

125 years. He elaborated that in most other places in Karunegala, more than 200 mm of rainfall was recorded on that day.

Mr. Kodippili espoused the budget in 2012, allocated by DMC, for emergency response. This is indicated in Table 6.

Table 6. DMC's budget allocation for emergency response in 2012		
Item	Budget Allocation for 2012 (in Million Rupees)	No. of items purchased
Motor boats	6.44	13
Water pumps	1.26	15
Water Bowser (10,000 liter capacity)	3.55	1
Life-saving jackets	6.3	2,076
Total	18.65	

Moreover, Mr. Kodippili continued to explain that the Disaster Management Ministry also purchased 21 motorboats and distributed the same to various DDMCUs in the country, in anticipation of emergency response that needs to be undertaken during hazards.

He proceeded to underscore the impacts of floods in Sri Lanka in 2012, indicated in Table 7.

Table 7. Impacts of floods in Sri Lanka in 2012

District	Affected		Deaths Reported	Injured People	Missing Peoples	Houses damaged		Evacuation Center		
	Families	peoples				Full	Partially	Non:	Families	Persons
Jaffna	1668	5,354				-	1531			
Kurunegala	4090	15231	3			573	910	8	335	1236
Badulla	62	233	5			26	829	1	22	86
Hambantota	6934	37745	4	01	03	-	-	8	420	1296
Ampara	750	2770	1	5	2	19	157	1	3	18
Kilinochchi	4815	18155	1			-	2639	11	663	2302
Puttalam	10717	41835	1			1002	2530	84	7357	28682
Anuradhapura	3612	11351	3			119	642	25	1097	3708
Matale	1803	5613	9	13	7	164	648	20	636	2220
Nuwara Eliya	313	1255			1	3	290	3	12	55
Batticaloa	62023	229946	8	1		2313	3599	30	3423	11367
Kandy	813	318	4	3		58	610	7	140	506
Mannar	6021	23880				576	1354	2	58	219
Vavuniya	14561	55746	1			106	188	64	2684	9946
Mulaitivu	21755	70449	1			667	12151	61	3563	12105
Polonnaruwa	1500	5544	3	18		106	573	17	1372	5122
Trincomalee	2910	10893	1	1		5	76	4	401	1299
Total	144,347	536,318	45	42	13	5,737	28,727	346	22,186	80,167

Following that, Mr. Kodippili focused his discussion on emergency/response activities, for floods, in December 2012. This is indicated in Table 8.

Table 8. Emergency/response activities facilitated by DMC, anent to floods, in December 2012

DISTRICT	ALLOCATED PERSONALS				NAVY BOATS	BOATS FROM CIVILIANS	REMARKS
	ARMY	NAVY	AIR FORCE	POLICE			
KURUNAGALA	500	60	06	-	10	-	Rescue operations carried out by Helicopters.
HAMBANTOTA	50	12	-	-	02	-	20 members of Search and Rescue volunteer committee engaged with the process.
PUTTLAM	250	25	-	-	04	15	-
NUWARA-ELIYA	30	-	-	-	-	-	-
MONARAGALA	30	8 Swimmers engaged	-	-	-	-	-
BATICALOA	500	20	-	-	04 STF and Army boats	-	587 persons rescued. Search and Rescue diving team fully engaged with the mission.
MATHALE	700	12	-	100	03	-	-Army and Police engaged with the rescue missions.
AMPARA	-	08	-	-	02	-	-
POLONNARUWA	500	40	-	-	09	-	-
MANNAR	500	100			10		
ANURADHAPURA	250			-			
TOTAL	3310	285	06	100	44	15	

According to Mr. Kodippili, some of DMC's key activities during the 2012-2013 Northeast monsoon season were:

- coordination with district and divisional secretaries, local authorities and GNs on preparedness and response activities
- coordination with government ministries, DOM, NBRO, DOI, RDA, DOH, MASL, Agrarian Service Department, Provincial Councils, DOF, and Disaster Management Committee members, among others
- coordination with UN institutions for synergy of preparedness/response activities
- coordination with army, navy, air force and police for rescue and relief missions in different areas in the country
- provision of required emergency/response equipment (e.g. water bowser, boats, emergency kits)
- coordination with media and relevant organizations in information dissemination, daily situation updates and early warning, prior to opening of spill gates in major tanks
- preparation of situation reports and continuous monitoring of situation
- monitoring of situation at evacuation centers
- coordination with Non Government Organizations (NGOs) for provision of necessary assistance for flood victims

The Sri Lanka Red Cross Society (SLRCS), espoused Mr. Kodippili, also provided response assistance to flood-affected population in December 2012. Assistance from SLRCS included:

- evacuation and rescue services
- first aid services
- temporary shelter
- temporary toilet facilities

- relief Items
- medicines
- situation assessments
- well cleaning/water purification services

Mr. Kodippili stressed that DMC had commenced its short message service (sms) information dissemination system via Dialog network through DMC's Disaster and Emergency Warning Network (DEWN). The sms information dissemination included the following information:

- situation report
- alerts
- rainfall information/forecast

3.2.4 DOI

Engr. Janaki Meegastenna, Director, DOI, presented the experiences and lessons learnt of the irrigation sector during the 2012-2013 Northeast monsoon season, summarized below:

Experiences and Lessons Learnt of DOI During the 2012-2013 Northeast Monsoon Season	
Awareness of DOM's seasonal forecast for the 2012-2013 Northeast monsoon season	Yes, DOI was aware of DOM's seasonal forecast for the 2012-2013 Northeast monsoon season
Understanding of seasonal forecast	Yes, the forecast was easily understood
Usability of seasonal forecast, for the 2012-2013 Northeast monsoon season	Yes, DOI was able to utilize the seasonal forecast for the 2012-2013 Northeast monsoon season
Relevance of forecast for planning and decision-making	<p>Yes, the forecast was relevant to the irrigation sector. Seasonal forecast is a basic requirement for seasonal planning and food production; and flood control initiatives to minimize potential damages, among others.</p> <p>However, decision-making in the irrigation sector was constrained by the fact that the forecast was not area- and time-specific.</p>
Decisions undertaken in anticipation of possible impacts as well as harness potential of the predicted climate condition during the 2012-13 Northeast monsoon season	<p>Decisions undertaken, by DOI, included, among others:</p> <ul style="list-style-type: none"> • Seasonal planning – starting water issuance with available storage or recommend to limit cultivation extent or change the crop type or forego cultivation • Flood control – maintain reservoir water level 1 meter below full supply level (FSL)

Institutional experiences in implementing decisions based on seasonal forecast	The 2012 Southwest Monsoon Forum (5 th Monsoon Forum) was too delayed to implement decisions based on seasonal forecast by DOM
Challenges/issues met in implementing decisions based on forecast	Decision-making is impeded by the lack of regionally-based forecast
Observations during the 2012-2013 Northeast monsoon season	<ul style="list-style-type: none"> • October was normally dry • Rain started in November • December was marked with the following: <ul style="list-style-type: none"> • Heavy intensity rainfall • Rainfall for the month of December was 3 or 4 times higher than normal/average
Lessons learnt	<ul style="list-style-type: none"> • Decision-making is hampered by the coarse resolution of forecast
Recommendations	<ul style="list-style-type: none"> • Organize forum at least one (1) month before the monsoon onset (end of March for the Southwest monsoon). DOI has many preparatory work to undertake prior to rainfall onset, hence the recommendation • Enhance flood control to minimize damages • Short- and medium-range weather forecast should be area-specific • Immediate dissemination of forecasts/warning information to the irrigation department via sms or email • DOM to generate and disseminate weekly forecast

Mr. Meegastenna subsequently expounded on the analysis of tank water storage during the season. Figure 15 shows that 47 of 71 major tanks have 100% storage in December 2012. In October of the same year, none of the tanks attained 100% storage. He elaborated by end of November 2012, tanks started to spill (Figure 16).

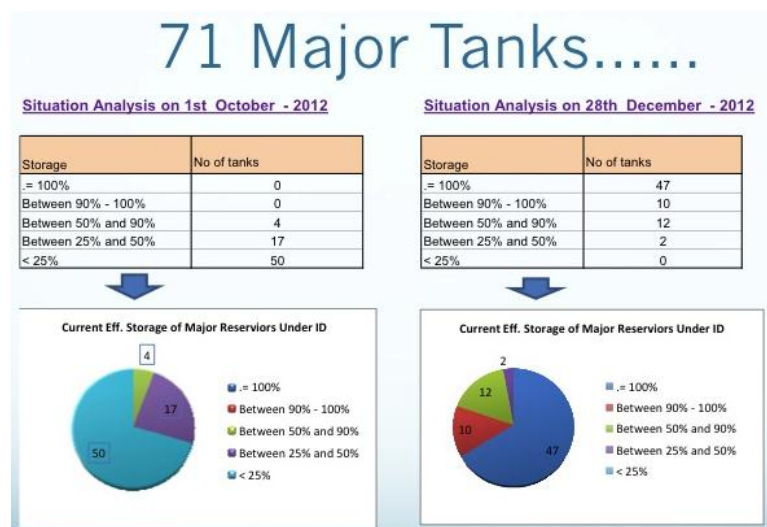


Figure 15. In December 2012, 47 of the 71 major tanks were full. Rainfall, in December, was above normal. In contrast, none of the major tanks in October 2012 was full.

Figure 16. In November 2012, tanks in Baticaloa, Hambantota, Putalam, Kurunegala, and Matale started to spill.

Subsequently, Mr. Meegastenna indicated that by December 2012, major tanks started to spill in Polonnaruwa, Anuradhapura, Trincomalee and Mannar, shown in Figure 17. Within the same month, medium tanks begun to spill as well. He elaborated that in Anuradhapura, 80 medium tanks spilled; 2 medium tanks spilled in Batticaloa; 3 in Bandarawela; 3 in Hambantota; 6 in Kurunegala; 2 in Monaragala; 1 in Trincomalee; 1 in Ampara; and 2 in Monaragala.



Figure 17. Major tanks in Polonnaruwa, Anuradhapura, Trincomalee and Mannar started to spill.

Storage variation, in different districts, from October 2012 to April 2013, is indicated in Figure 18.

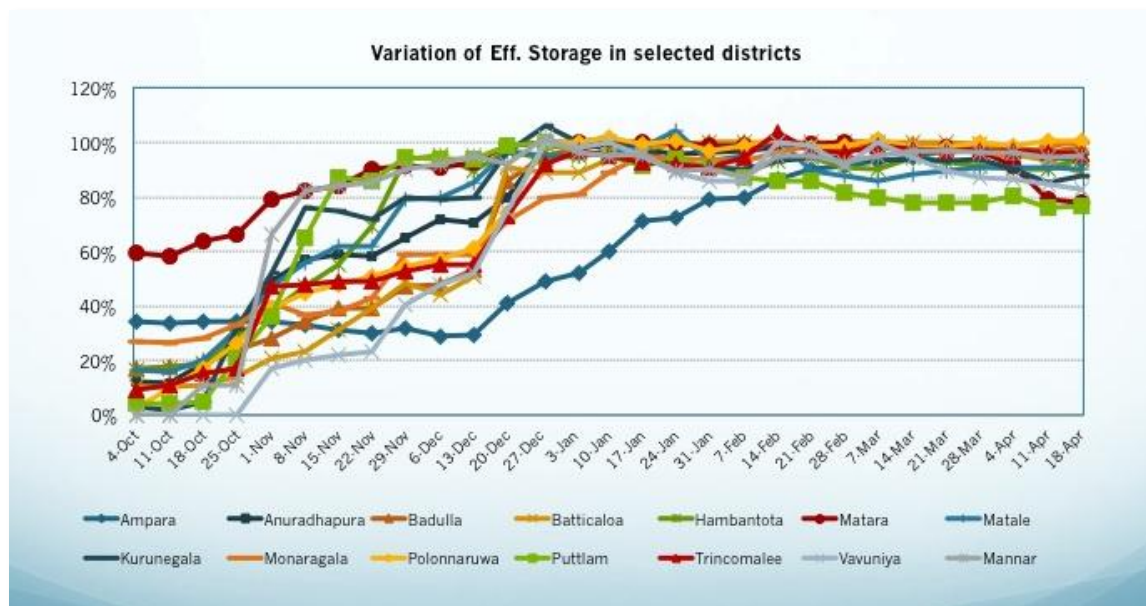


Figure 18. Storage variation in various districts in Sri Lanka, from October 2012 to April 2013

Behavior of key tanks in the country, from December 2012 to January 2013, was then discussed, as shown in Figure 19.

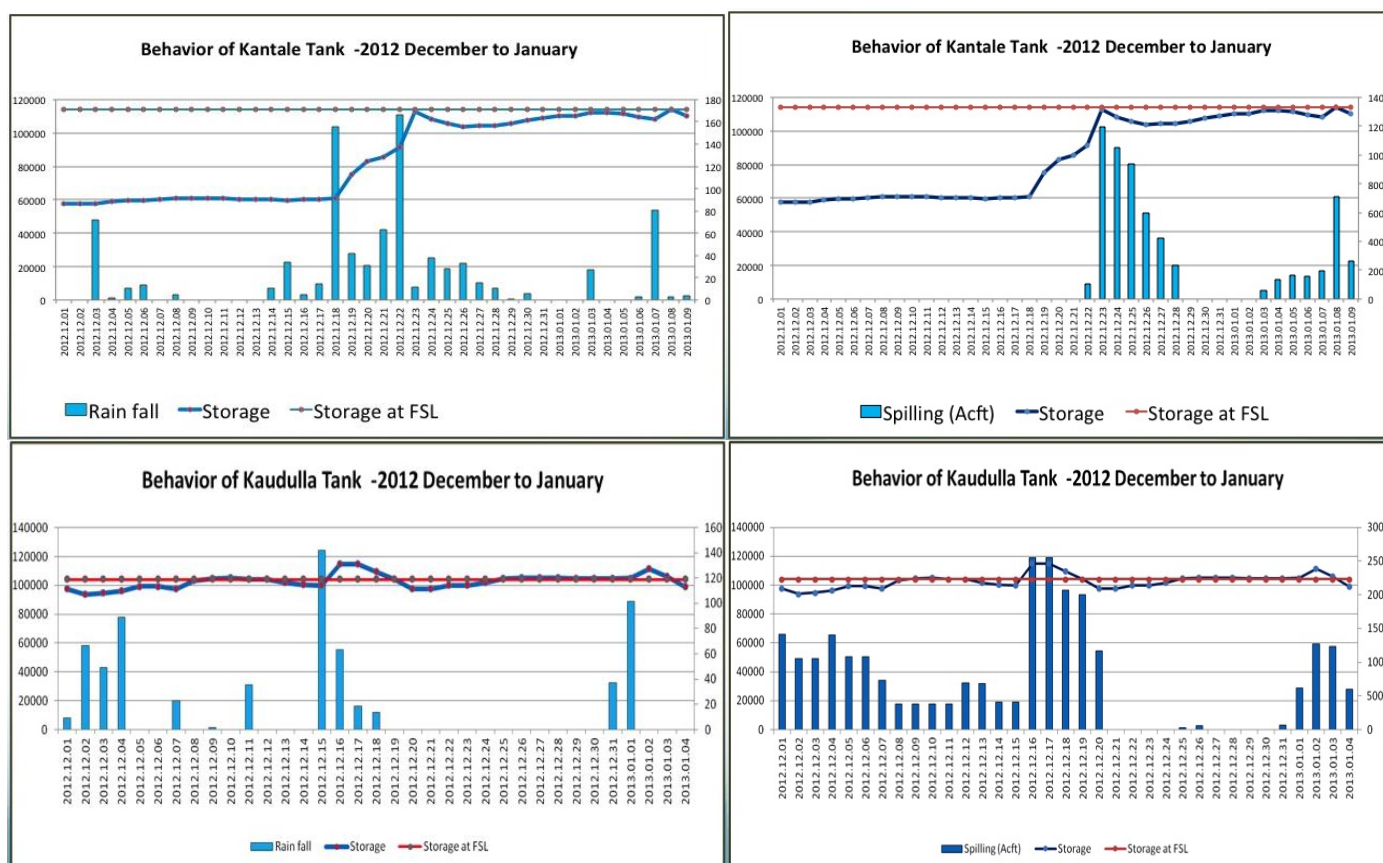


Figure 19. Behavior of key tanks in Sri Lanka, from December 2012 to January 2013

Mr. Meegastenna presented the damages on crops due to climate hazards in 2012 and early part of 2013. This is presented in Table 9.

Table 9. Damages to crops due to climate hazards in 2012 and early part of 2013						
Crop Failure 2012 Drought			Crop Failure 2012/2013 Flood			
District	Area of Crop Damage (in Acres)	Total	District	Area of Crop Damage (in Acres)		Total
				Partly	Fully	
Ampara	1400	1400	Ampara	-	360	360
Anuradhapura	100	100	Anuradhapura	4053	5545	9598
Badulla	10	10	Trincomalee		3862	3862
Polonnaruwa	1342	1342	Polonnaruwa		4479	4479
Puttalam	150	150	Puttalam	165	1682	1847
Ratnapura	1	1	Colombo		30	30
Kurunegala	9297	9297	Galle	-	222	222
Monaragala	220.5	220.5	Kandy	-	146	
Total		20,544	Total			12,521

A comparison between maha and yala¹ cultivation areas, from 2004 to 2013, then was presented. This is indicated in Figure 20.

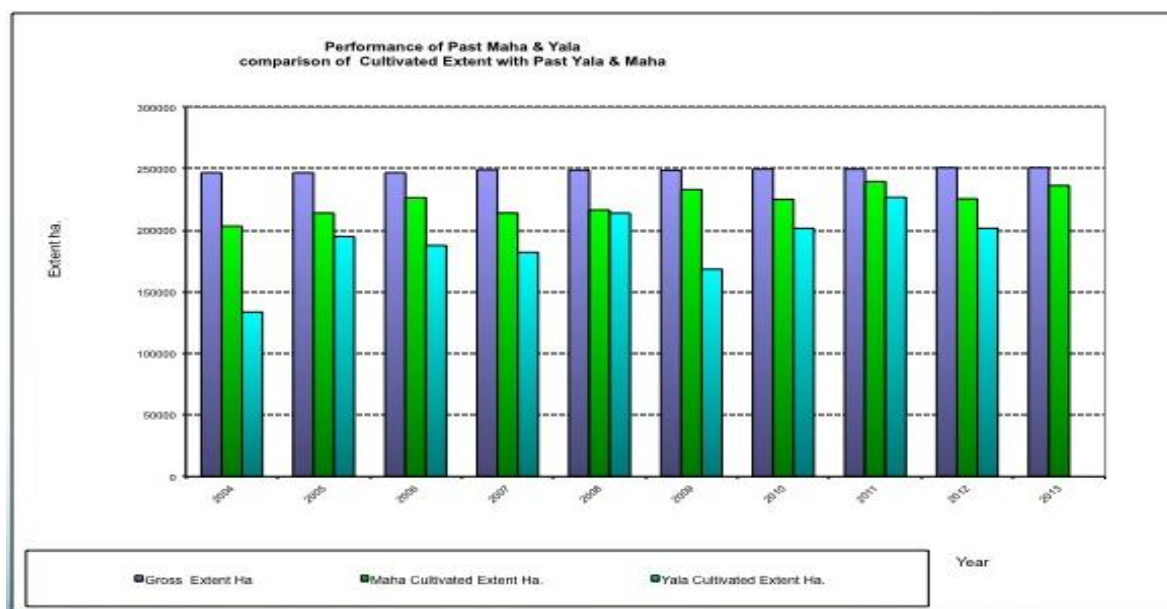


Figure 20. Yala (in blue) and Maha (in green) cultivation areas, from 2004 to 2013

3.2.5 Local Government of Pottuvil

The Local Government of Pottuvil explained that the Bay of Bengal lies on the Eastern part of the division, hence Pottuvil is prone to climate-related hazards. It was expounded that Pottuvil Division is most prone to flood, drought, and coastal erosion. The Local Government of Pottuvil also recalled that the 2004 Indian Ocean Tsunami impacted heavily on the division.

In Pottuvil, heavy rain was experienced from November 2012 to March 2013 which conformed with the forecast provided by DOM during the 6th Monsoon Forum, in Colombo, in November 2012. He emphasized that although heavy rain caused severe flood, the impacts were reduced because of measures implemented by the Division Disaster Management Committee.

Rainfall in Pottuvil, for the season, was recapped, as follows:

Table 10. Rainfall recorded in Pottuvil, December 2012 – March 2013	
Month	Rainfall (in mm)
December	430.5
January	433.9

¹ Yala and Maha are the agricultural growing seasons in Sri Lanka. Maha, considered as the major growing season in the country, extends from mid-September up to February. On the other hand, Yala season covers mid-March to early May.

February	200.4
March	164.2

The following were provided by the Local Government/DDMCU of Pottuvil:

- Pottuvil is surrounded by Headoya, Dhuwva, and Kottuval Rivers, among others
- Usually, farmers are able to obtain sufficient water, for their agricultural activities, from the said rivers
- During the 2012-2013 Northeast monsoon season, farmers were affected by floods
- Agricultural activities and infrastructure facilities were severely affected by the floods during the season
- Three (3) flood bunds were destroyed
- 1,700 acres of paddy, already in its harvesting stage, was damaged
- Several farming-dependent families were affected
- In February and March 2013, lightning strikes destroyed 10 insulators in four (4) towers at Sengamam Grama Niladhari (P/17) and some electrical instruments in religious establishments
- DDMCU have difficulty to evacuate people to safer places due to some social, cultural and economic issues. Migrating to common shelters like schools, religious places and camps are not always welcome due to a variety of reasons
- Very hot climate was experienced after the 2012-2013 Northeast monsoon; the hot climate triggered drought; most water bodies dried up

Pottuvil Division then highlighted RIMES contribution to disaster risk management in the division.

Section 4

SEASONAL CLIMATE OUTLOOK FOR THE 2013 SOUTHWEST MONSOON SEASON



4.1 Presentation of Seasonal Outlook for the 2013 Southwest Monsoon Season

The seasonal outlook for the 2013 Southwest monsoon season was delivered by Ms. Shiromani Jayawardena, Meteorologist, DOM.

Ms. Jayawardena commenced her presentation by explaining that the climate of Sri Lanka is monsoonal. She continued that life and economy in the island is critically dependent on the Southwest and Northeast monsoons. She explained that 30% of the average annual rainfall, in Sri Lanka, is supplied by the Southwest monsoon, clearly indicating the importance of the season, and its associated rainfall, in the country. She presented the normal monthly rainfall values, in Figure 21. Subsequently, normal rainfall values, in different areas in the country during the Southwest monsoon season, are provided in Figure 22.

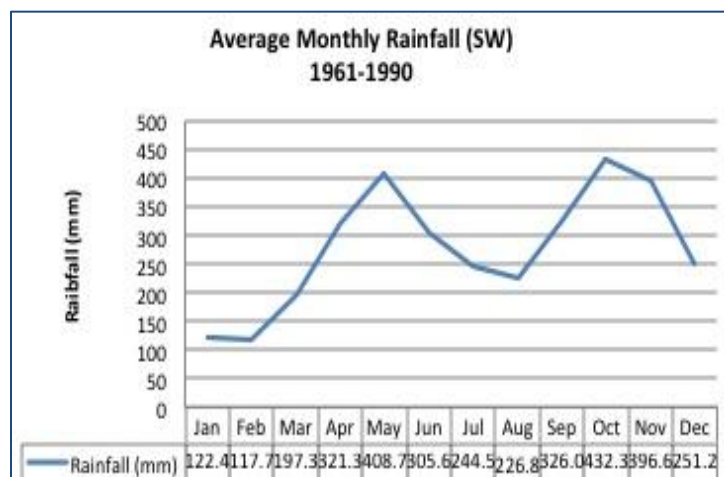


Figure 21. Normal monthly rainfall values from 1961-1990

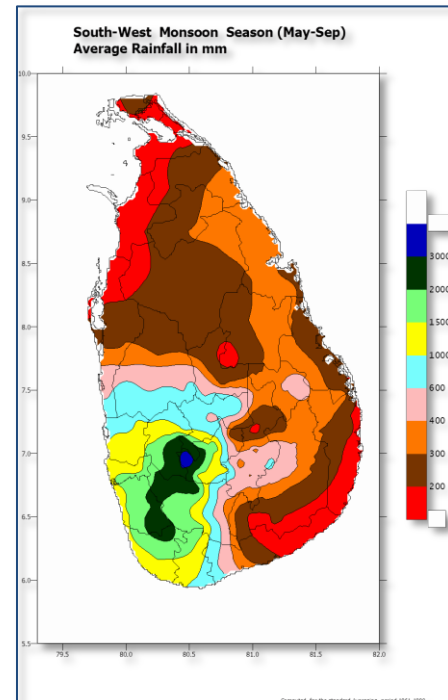


Figure 22: Normal rainfall values, in different parts of Sri Lanka, during the Southwest Monsoon Season

Ms. Jayawardena then explained that the outlook for the 2013 Southwest Monsoon Season was generated by DOM, based on the following:

- outputs from different empirical and dynamical climate models
- probabilistic forecast output from Climate Predictability Tool (CPT)
- various prevailing global climate conditions

Models used in/centers generating the forecast, expounded Ms. Jayawardena, included:

- World Meteorological Organization's (WMO) Lead Center for Long-Range Forecasting (Multi-Model Ensemble)
- Meteo France - ARPEGE Model
- Australia's Bureau of Meteorology (BOM) Seasonal Forecasting Model
- CFS model: National Centers for Environmental Prediction (NCEP), USA
- EUROSIP

- European Center for Medium-Range Weather Forecasting (ECMWF)
- Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
- APEC Climate Center (APCC)
- Japan Meteorological Agency (JMA)
- UK Met Office - Global Seasonal Forecasting Model (GloSea)

She then expounded WMO's coordination of centers producing long-range forecasts (LRFs) or the Global Producing Centers (GPCs). These are:

- 12 WMO-designated GPC centers adhering to agreed procedures/standards in LRF (includes the Beijing Climate Center; Center for Weather Forecasts and Climate Studies (CPTEC); ECMWF; Met Office Hadley Center; BOM; Meteorological Service of Canada (MSC); Korean Meteorological Agency (KMA); JMA; Meteo-France; NCEP; Hydromet Centre of Russia; and South African Weather Service)
- 2 lead centers facilitating user access to GPC products
- Lead Center for Long-Range Forecast Multi-Model Ensemble (LC-LRFMME) jointly operated by KMA and National Oceanic and Atmospheric Administration (NOAA)-NCEP

She then explained that the Lead Center for Standard Verification System for Long-Range Forecasts (LC-SVSLRF) is jointly operated by BOM and MSC.

Probabilistic model outputs for the Southwest monsoon season, from various centers, were then discussed, as presented in Figures 23 to 29.

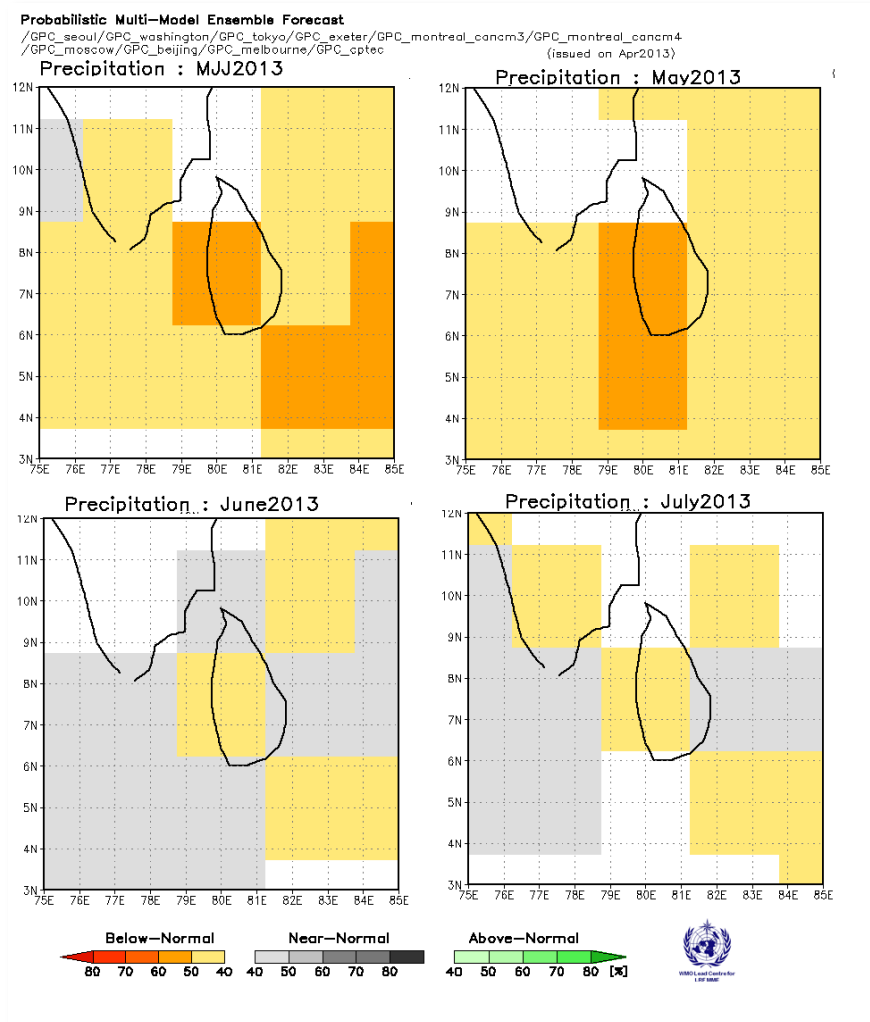


Figure 23 shows the probabilistic multi-model ensemble

Figure 23. Probabilistic multi-model ensemble forecast from WMO GPCs indicating likely precipitation conditions over Sri Lanka, from May to July 2013

forecast from WMO GPCs. The forecast indicated that for May, June and July 2013, monthly rainfall over Sri Lanka is likely going to be below normal.

On the other hand, Figure 24 shows Meteo France's probabilistic forecast for precipitation, for May-June-July (MJJ), June-July-August (JJA), and July, August, September (JAS) 2013.

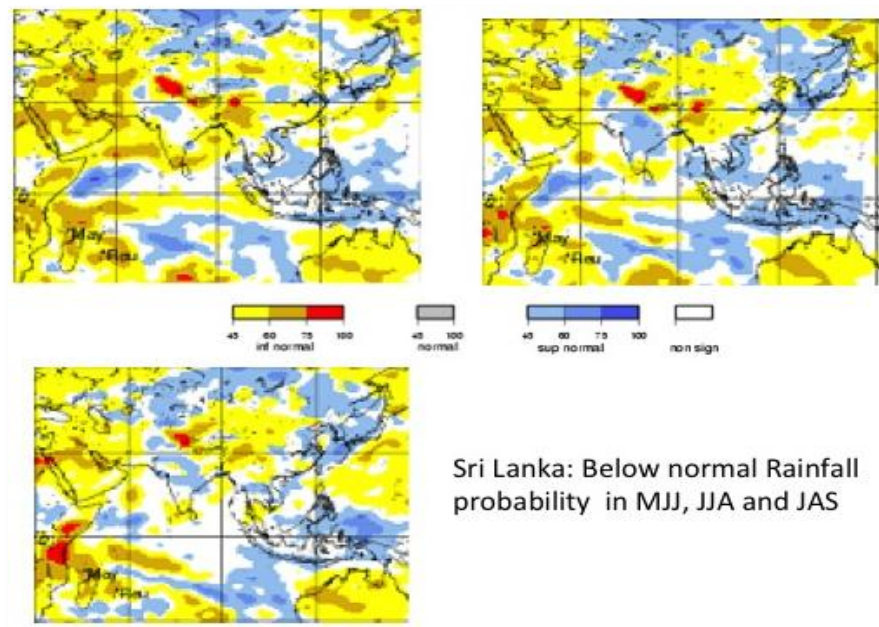


Figure 24. Meteo France's probabilistic precipitation forecast, for MJJ, JJA and JAS suggesting the likelihood of below normal rainfall over Sri Lanka for the mentioned months

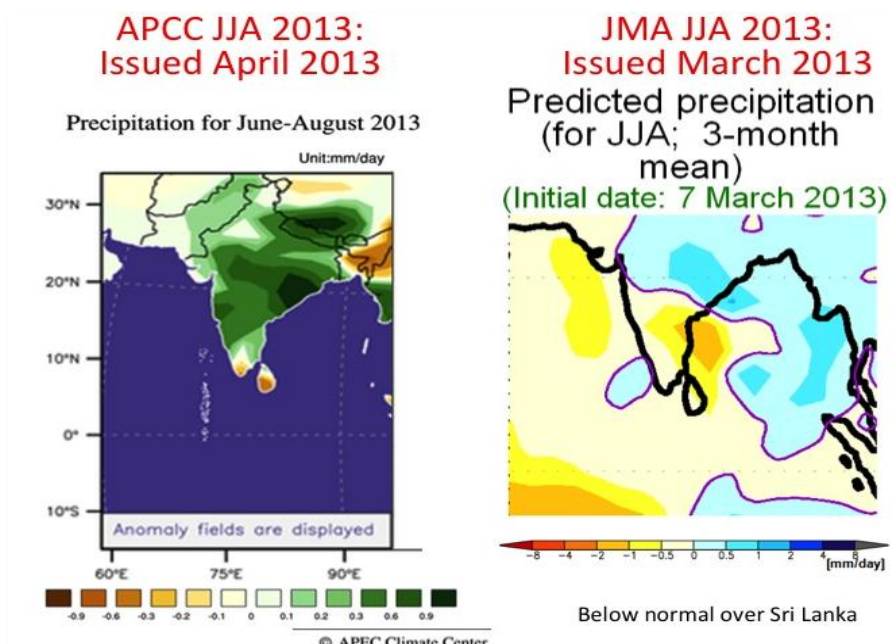


Figure 24. APCC's precipitation forecast for June to August 2013 shows the probability of below normal rainfall, for the mentioned months, over Sri Lanka

Probabilistic forecasts of precipitation

EuroSIP

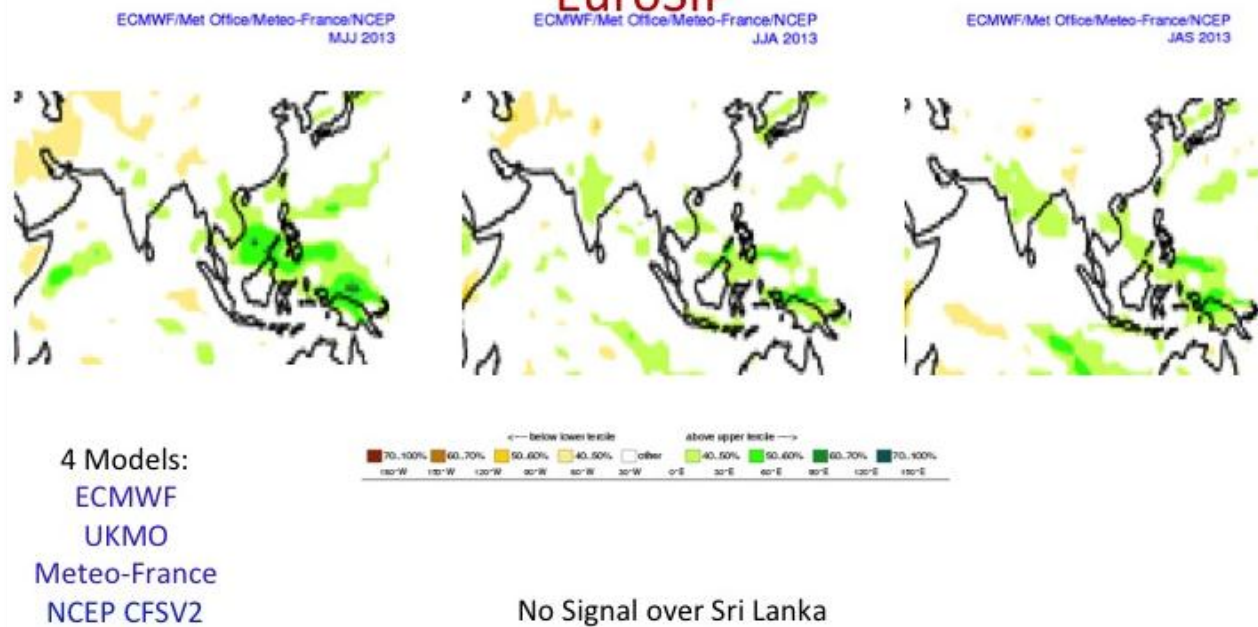


Figure 25. Probabilistic forecast from ECMWF, UK Met Office, Meteo France, and NOAA-NCEP does not show signal over Sri Lanka for the season

Precipitation / Rainfall Tercile Probabilities

Start Date: 2013-04-11

Period: (JJA) 01/06/2013 to 31/08/2013

Period: (JAS) 01/07/2013 to 30/09/2013

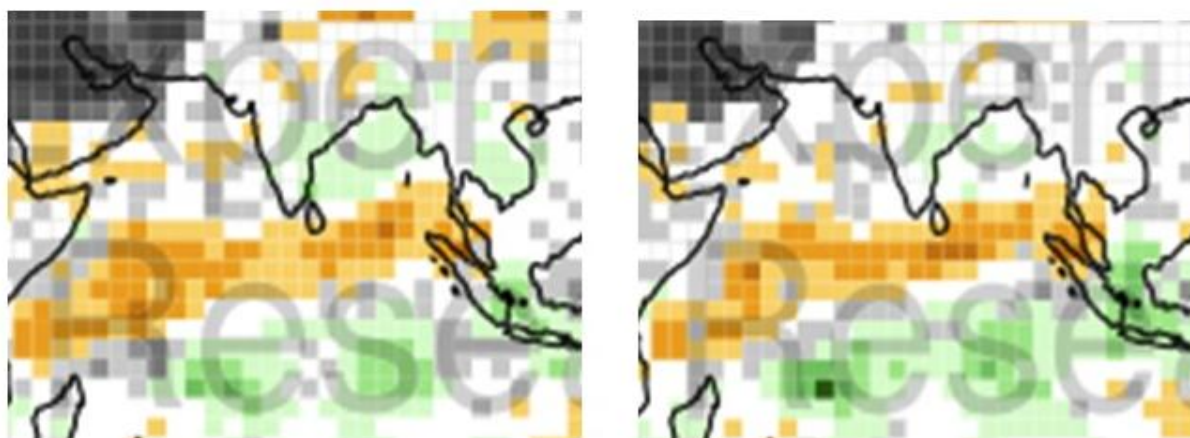


Figure 26. Probabilistic precipitation outlook, over Sri Lanka, from BOM indicates likelihood of below normal rainfall for JJA and JAS periods

Rainfall anomalies Predicted by the CFS T382 (Initialized with Feb. Initial Conditions): IITM. Pune JJAS 2013

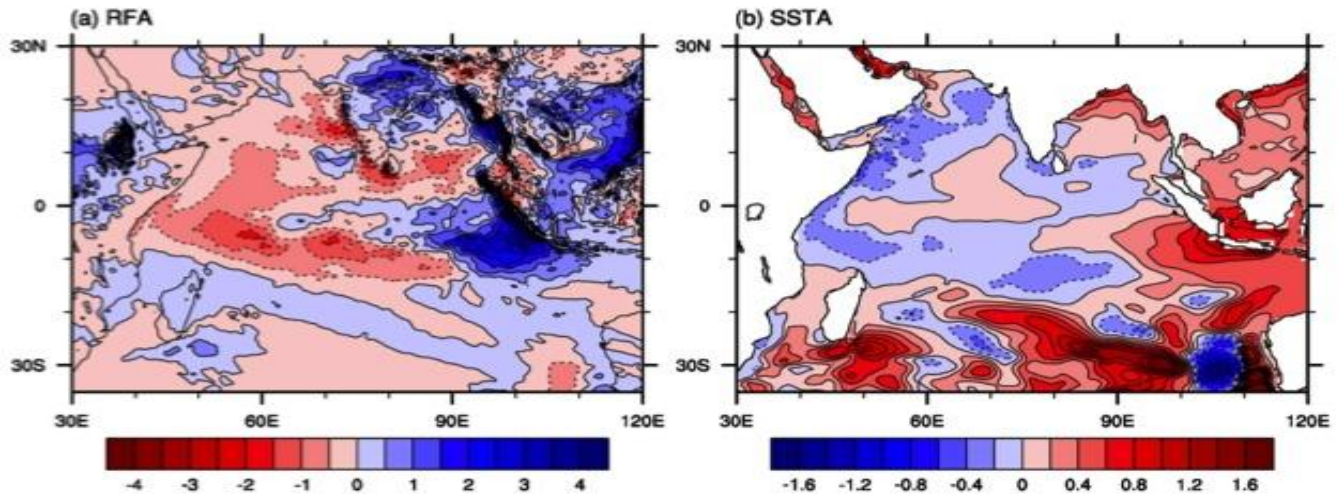


Figure 27. Rainfall and sea surface temperature anomaly generated by the Indian Institute of Tropical Meteorology (IITM), Pune.

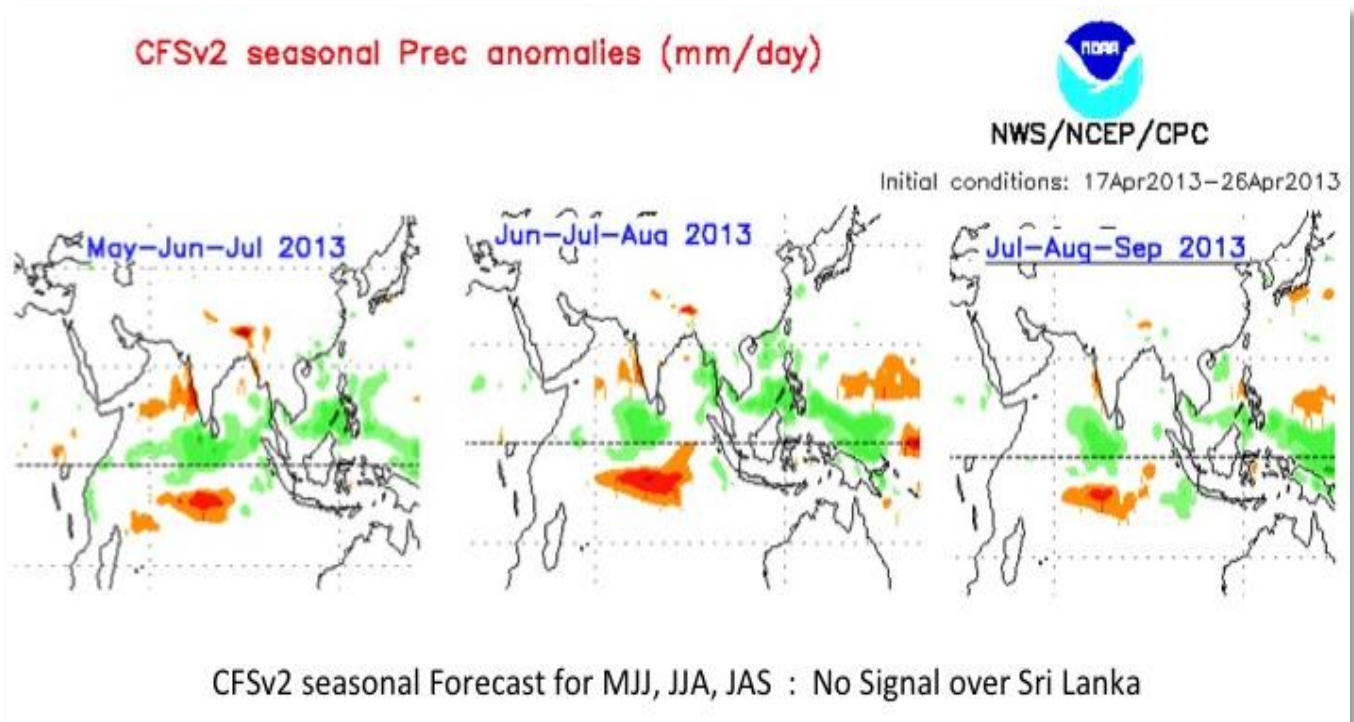


Figure 28. NOAA-NCEP model output does not detect signal for Sri Lanka for MJJ, JJA and JAS

CPT (Climate Prediction Tool) Forecast

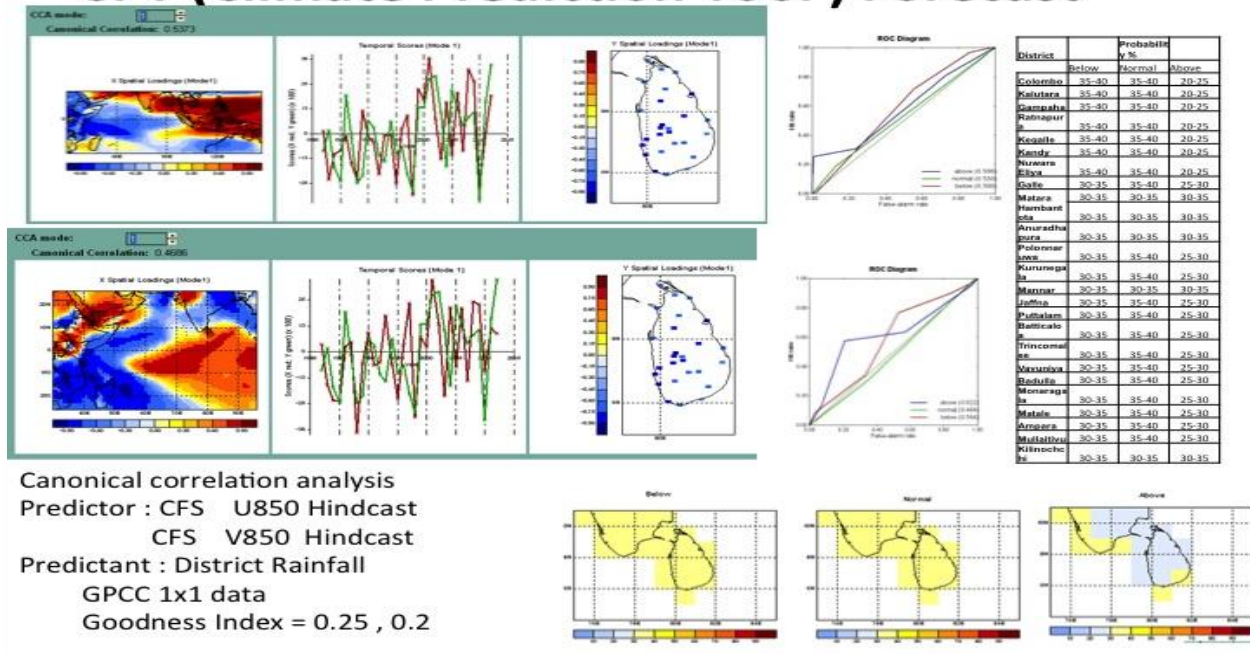


Figure 29. CPT outlook indicating higher probabilities of below normal and normal rainfall over Sri Lanka during the Southwest monsoon season

Ms. Jayawardena then discussed some key conditions affecting seasonal climate behavior in Sri Lanka. She underscored that ENSO is one of the key drivers of climate in the country. According to Ms. Jayawardena, latest forecasts from many dynamical and statistical models suggest that ENSO-neutral condition is likely to continue during the monsoon season (about 60% probability). During the later part of the season however, continued Ms. Jayawardena, some statistical models indicate possibility of weak La Nina while others show weak El Nino (Figure 30).

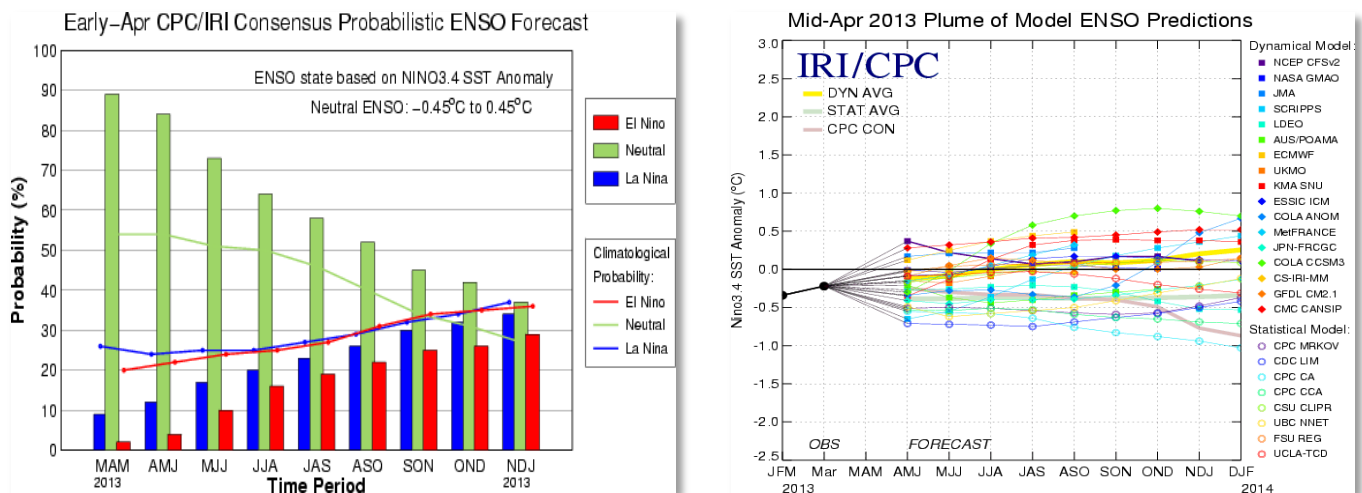


Figure 30. Left: consensus outlook by Climate Prediction Center/International research Institute for Climate and Society (CPC/IRI) indicating divergence in probabilities of occurrence of El Niño and La Niña conditions, towards the end of the season; Right: Plume of different model outputs for probable ENSO behavior during the season

She continued that the Indian Ocean sea surface temperature also influences monsoon performance in Sri Lanka. According to her, negative Indian Ocean Dipole (IOD) weakens the monsoon.

She expounded that recent forecasts suggest development of weak IOD during the Northern Hemisphere summer, with peak during the Northern Hemisphere autumn². Negative IOD, however, is likely to evolve only towards the end or after the monsoon season, hence it is unlikely to have much impact on monsoon circulation, especially in the early part of the season.

Summary of model outputs, for Sri Lanka, by different international/regional climate centers was then provided, shown below in Table 11.

Table 11. Summary of model outputs for Sri Lanka for the Southwest monsoon season

MR Model	IITM CFSV2	NCEP CFS-2	ECMWF	APEC	EURO SIP	JMA	BOM	UKMO	WMO LC MME	CPT	FINAL
-2	BN	No Sig	No Sig	BN	No Sig	BN	BN	BN	BN	No Sig	BN/N/AN 40/35/25

Consensus outlook for 2013 Southwest monsoon season, for the South Asian region, discussed during the South Asian Climate Outlook Forum (SASCOF) is presented in Figure 31.

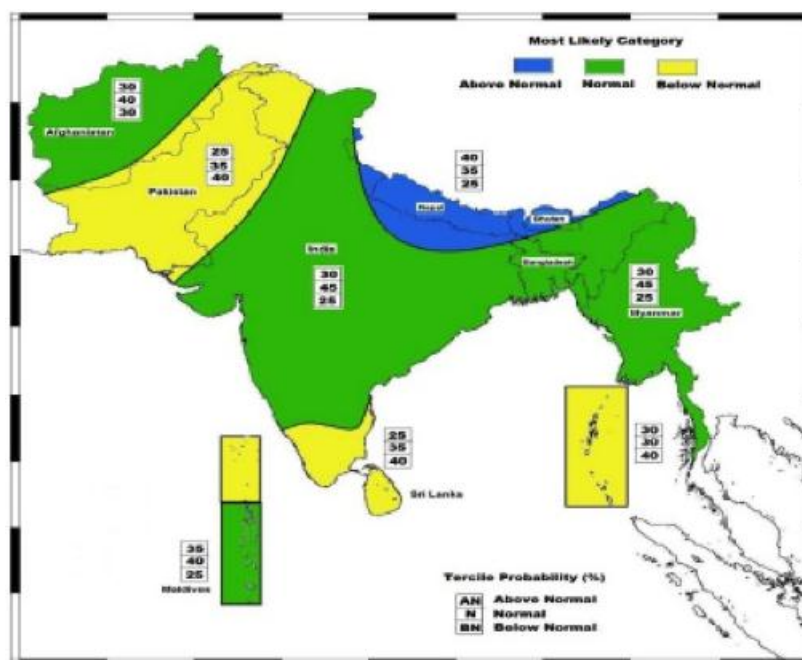


Figure 31. Consensus outlook for the South Asian Region, released during the SASCOF. The consensus outlook denotes below normal rainfall for Sri Lanka

² Northern Hemisphere summer starts on the summer solstice (21 June) and ends on the autumnal equinox (22 September). The autumnal equinox signals the beginning of the Northern Hemisphere autumn/fall which ends on 21 December or the so-called winter solstice.

Ms. Jayawardena then provided the following conclusions for the 2013 Southwest monsoon season:

- Based on prevailing climate conditions and forecasts from various statistical and dynamical models, the 2013 Southwest Monsoon Season (May to September) in Sri Lanka is likely going to be below normal
- It is recognized that there is large uncertainty associated with the forecast information, partly due to well-known spring time predictability limitations and partly to the absence of strong climate drivers in the Pacific and Indian Oceans during the season
- There is a need for continued monitoring of the regional and global climatic conditions associated with the 2013 Southwest monsoon
- There is likewise a need to update the forecast based on the results of monitoring of the said regional and global climatic conditions

Section 5

POTENTIAL IMPACTS OUTLOOK AND RESPONSE OPTIONS



5.1 Working Group Discussion

Participants were divided into groups, based on the sectors they represented. The groups were:

- Agriculture and Plantation
- Water Resources, Irrigation and Energy
- Disaster Risk Management

Groups were provided time to discuss, based on the following guide questions:

- What are the possible impacts, on your sector, in the next few months (May to September 2013), based on DOM's seasonal forecast?
- What can be done to address/mitigate the possible impacts?
- What can be done to take advantage of the potential climate in the next few months?
- What are your recommendations to enhance the generation and application of forecast?

5.2 Group Outputs

Outputs, from group discussions, are provided below:

Group 1 Agriculture and Plantation	
Anticipated impacts based on forecast	Paddy
	<ul style="list-style-type: none"> • Water stress in paddy systems especially in Polonnaruwa, Trincomalle • Less impact on other field crops (OFC) • Wet zone paddy cultivation may benefit
	Rubber
	<ul style="list-style-type: none"> • Increased number of tapping days • Adverse impact on replanting/new plantation • Decreased disease incidence in mature plants
	Coconut
	<ul style="list-style-type: none"> • Increased seedling mortality • Decreased disease incidence in mature plants
	Tea
	<ul style="list-style-type: none"> • Negative impact on planting • Decreased disease incidence in mature plants
	Sugarcane
	<ul style="list-style-type: none"> • No significant impact on yield • Decreased disease incidence • Increased sugar recovery
	Export Agriculture
Mitigation Measures	<ul style="list-style-type: none"> • Adverse impact on replanting • Decrease in pepper yield
	Forest Plantation
	<ul style="list-style-type: none"> • Adverse impact on replanting • Positive impact for timber harvesting • Increased timber quality
	Paddy
	<ul style="list-style-type: none"> • Increase irrigation interval

Recommendations	<ul style="list-style-type: none"> • Decrease irrigation frequency • Increase farmer awareness • Use short-age paddy variety • Promote OFC
	Plantation, Sugarcane, DEA, Forest Plantations
	<ul style="list-style-type: none"> • Practice moisture conservation measures
	Implement mitigation measures

Group 2 Water Resources, Irrigation and Energy	
Anticipated impacts based on forecast	<ul style="list-style-type: none"> • Shortage of water for agriculture and domestic use, as well as for hydro-power generation • Crop failures; power failures • Deterioration of water quality
Mitigation Measures	<ul style="list-style-type: none"> • Strict/good water management practices • Crop diversification • Restricted/regulated water supply • Reduction in hydro-power usage • Maximize thermal power
Recommendations	<ul style="list-style-type: none"> • Conduct Monsoon Forum earlier (late march) • Enhance spatial and temporal forecast resolution • The Monsoon Forum should include the presentation of a more specific forecast, then a general one

Group 3 Disaster Risk Management	
Anticipated impacts based on forecast	<ul style="list-style-type: none"> • Drought • Salt-water intrusion • Lack of drinking water • Rise of incidence of epidemics • Reduction in land stability • Crop failures • Increased incidence of animal attacks
Advantages	<ul style="list-style-type: none"> • Renovation of water tanks would be possible • Improvement initiatives for irrigation canals could be done • Possible increase in paddy yield in Ampara
Mitigation Measures	<ul style="list-style-type: none"> • Water management practices • Deploying of water tanks to water deficit areas • Preparedness activities • Establishment and use of rainwater tanks and “pathas” (agro-wells)
Recommendations	<ul style="list-style-type: none"> • Provide facilities and awareness on preparation of rainwater harvesting tank • Community preparedness activities for drought

- Storing of dry food items
- Activating disaster management committees

Section 6

ISSUES AND CONCERNS ON TSUNAMI PREPAREDNESS



6.1 Updates on the progress of the implementation of the project “Enhancing coastal hazard early warning and response: tools and institutional strengthening” in Sri Lanka

Mr. Kodippili, country focal point for the project, explained that the project “Enhancing coastal hazard early warning and response: tools and institutional strengthening” is supported by UNESCAP and RIMES and implemented in Sri Lanka through the partnership of various government institutions, to include:

- CCD
- DMC
- DOM
- NARA
- Survey Department

He indicated that the project intends to enhance response for tsunami warning through a) contribution to availability of tools and data for tsunami risk assessment; b) building of tsunami risk assessment capacities within mandated institutions in Sri Lanka; c) improved warning information generation and dissemination; and d) improved tsunami warning response within disaster management organizations and communities.

He discussed that the project stakeholders decided to pilot the same in Hambantota and that bathymetric, topographic and exposure surveys were already conducted in April 2013. He said that the next stage for the project would be the data processing/training which would be conducted at RIMES.

Mr. Kodippili assured the participants that outputs of the project would be shared in subsequent Monsoon Forums.

Section 7

SYNTHESIS OF DISCUSSIONS AND RECOMMENDATIONS



6.1 Summary of Discussions

Discussions, during the 7th Monsoon Forum, are summarized hereunder:

- **Forecast resolution**

DOA indicated that it has good communication mechanism with DOM. It was espoused that once DOA receives forecast from DOM, the information is translated into farmers' language and disseminated.

DOA, however, emphasized the requirement of the sector for forecast at a very fine. On the other hand, DOA expressed its recognition that at the moment, generation of very fine resolution forecast, in DOM, would not be possible due to a variety of reasons, to include gaps in equipment and human resource. Due to such limitations, forecasts specific to agro-climatic zones, at the time being, would suffice.

DOA espoused that normally, prior to the monsoon season, the agriculture sector conducts a meeting, hence knowing possible monsoon conditions in different agro-climatic zones would be useful.

- **Sectoral preparedness**

DMC espoused that while DOM already provided forecast for the 2012-2013 Northeast monsoon season, more preparedness has to be undertaken by different user sectors. It was highlighted that in the past season, more than 80,000 people were displaced by the flood and many agencies have to conduct rescue and relief operations.

- **DOM's requirements in enhancing forecast products**

DOM expounded that it wishes to improve its seasonal forecast and other forecast products, but many gaps deter this goal. One of the gaps is the lack of human resource, especially because of the opening of the Matale airport.

- **Diverse lead time requirements of stakeholder institutions**

Though many sectoral stakeholders indicated that conducting the Monsoon Forum at the end of April provides them with sufficient lead time, DOI indicated that for the irrigation sector, the best time to conduct the Monsoon Forum is at the end of March. This is because the irrigation sector needs more time for preparatory actions before the monsoon season.

- **Seasonal forecast updating by global and regional centers**

In response to queries from stakeholders, DOM explained that global and regional centers provide monthly updates on the seasonal forecast. The query from stakeholders was rooted on the discussion that the seasonal forecast for the 2013 Southwest monsoon season was associated with large uncertainty because of the absence of strong predictors or drivers of likely climate behavior for the season.

6.2 Key Recommendations

Key recommendations, during the 7th Monsoon Forum, are provided below:

- **Enhanced spatial and temporal forecast resolution**

Stakeholders recommended that forecasts be improved in terms of spatial and temporal scale. Though it was acknowledged that very fine forecast resolution could not be generated at the moment because of various gaps that has yet to be addressed in DOM (e.g. outdated observation equipment, shortage of staff, etc.), agro-climatic zone-specific forecast would be most useful. It was also indicated that both short- and medium-term forecasts be area-specific and time-specific. Provision of weekly forecast was also recommended.

- **Enhanced conduct of Monsoon Forum**

Though most stakeholder institutions conform with the conduct of the Monsoon Forum, vis-à-vis the Southwest monsoon season, at the end of April, DOI recommended that due to the various preparatory activities that the institution has to undertake prior to monsoon onset, the Forum for the Southwest monsoon be conducted in late March.

On the other hand, RRISL recapped the recommendation during the 6th Monsoon Forum for DOM to conduct a Forum/awareness program with plantation extension personnel and estate managers for enhanced forecast uptake. This activity could be conducted separately from the national level Monsoon Forum.

Another recommendation was for the inclusion of shorter-term/specific forecasts as supplement to the general forecast.

- **Forecast content**

Monthly rainfall forecast should indicate observed rainfall for the previous month, as user's reference, to facilitate stakeholders to better anticipate forecast rainfall for the subsequent month (refer to Figure 13).

- **Simplification of forecast**

DMC recommended that a mechanism to ensure that simple information is delivered to the public should be evolved.

- **Forecast dissemination**

Stakeholders appreciated DOM in providing, on a regular basis through email, monthly and 3-monthly forecasts, as response to stakeholder recommendations during the 6th Monsoon Forum.

It was however emphasized that DOM could also explore using sms in disseminating forecasts. This recommendation was also put forward during the 6th Monsoon Forum. Using sms was advocated by participants, in both the 6th and 7th Monsoon Forum, because the information could reach stakeholder institutions relatively fast through sms.

A redundant mechanism of sending forecasts immediately to user sectors should be evolved.

- **Updating of forecast**

Seasonal forecasts should be updated, in monthly intervals and mid-season.

- **Enhanced sectoral preparedness**

Preparedness should be enhanced in different stakeholder sectors. While DOM provided the correct forecast for the 2012-2013 Northeast monsoon season, preparedness by different sectors was not sufficient. Hence, enhanced preparedness has to be undertaken by user sectors. For disaster/water resources managers for example, enhancement of flood control facilities could be done to minimize potential damages, in case of forecast normal to above normal rainfall. Further, it was recommended that a mechanism for enhanced water management be developed.

- **Enhanced collaboration between DOM and stakeholder institutions**

It was recommended that enhanced collaboration between DOM, the plantation sector, and other institutions be fostered to enhance application of forecast information. A proposed mechanism for information sharing between DOM, RRISL and other institutions was indicated in Figure 14.

- **Establishment of an Agro-meteorology Advisory Service (AAS)**

DOA recapped the recommendation from the 6th Monsoon Forum that an Agro-meteorological Advisory Service (AAS) be established through the collaboration of DOM and DOA. Details of the recommendation, lifted from the 6th Monsoon Forum, are provided below.

Agricultural advisories, in farmers' language, could be generated and disseminated by DOA based on forecasts issued by DOM.

The AAS Cell should be established, composed of a team of scientists and extension agronomists, within DOA. The AAS should be directly linked to NMC of the DOM.

The process of forecast receipt, and development and dissemination of agro-advisories by DOA is detailed below:

- Short and medium-range forecasts issued by the NMC should be directly provided to AAS; forecasts should be area-specific.
- Preparation of agricultural advisories by the AAS Cell
- Dissemination of agro-advisories to farmers through a) farm broadcasting service; b) online agricultural extension service; c) cyber extension service; d) printed and electronic media; e) SMS alert system

Section 7
WAY FORWARD AND
CLOSING SESSION



7.1 Synthesis

Ms. Policarpio provided a synthesis of discussions and recommendations.

7.2 Way Forward and Closing Remarks

7.2.1 Way Forward

Delivered by Ms. S. Marina Mohamed, Secretary, Ministry of Disaster Management, the importance of the Monsoon Forum, as a regular interface for enhancing forecast application, was highlighted. According to her, forecasts are very essential for agriculture, plantation and other sectors.

According to Ms. Mohamed, DOM is more than 100 years old but there are still rooms for improvement. One manifestation of DOM importance, continued Ms. Mohamed, is on air travel as decisions on the same could not be made without forecast from DOM. She elaborated that the plantation sector (tea, rubber, coconut, etc.) wait for the monsoon rain to commence plantation activities. With these examples, she said that forecast is extremely important in planning. She continued to explain that the electricity bill is anticipated to be increased in the immediate future and further stress in power supply could be experienced in Sri Lanka if the Southwest monsoon would not perform well.

She then recalled that there are two (2) monsoon and two (2) inter-monsoon seasons in Sri Lanka. Ms. Mohamed recapped that 18 districts were hit by floods in November and December 2012. She also cited drought events in the country prior to the floods. According to her, extreme impacts of droughts and floods could have been minimized if water was managed better.

She stressed that Sri Lanka, for the most part, is still reactive rather than proactive. She advocated that stakeholders have to be proactive for enhanced management of risks. Ms. Mohamed continued that with climate change, the role of DOM would be more highlighted.

According to Ms. Mohamed, the Monsoon Forum has benefitted the stakeholders in Sri Lanka.

7.2.2 Vote of Thanks and Closing Remarks

Mr. S.H. Kariyawasam, Director-General, DOM, thanked all the participants for their presence and valuable inputs. He also thanked UNESCAP and RIMES for supporting the Monsoon Forum. He indicated that despite the many challenges and capacity caps, DOM is trying its best to cater to the needs of its stakeholders. Mr. Kariyawasam took note of the recommendations from stakeholders and indicated that DOM would work towards meeting those recommendations.



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