Over 90% of the natural disasters which occurred in Sri Lanka during the last 50 years are mainly weather-related disasters such as floods, droughts, landslides triggered by heavy rainfall, lightning, and strong winds. Between years 2000 and 2010, more than 13.0 million people in Sri Lanka have been affected by these natural disasters. Furthermore, the occurrence of extreme weather-related events and natural hazards are becoming more intense and frequent. There is global concern that climate change mainly due to global warming has a potential to increase the severity of these extreme weather events even further.

The Department of Meteorology (DOM) is the government agency mandated to provide meteorological and climatological services and early warning information for weather hazards and tsunami in Sri Lanka. Since meteorological hazards are becoming more and more intense and frequent, the role of the DOM has become more important and crucial.

It is necessary that the DOM enhances its capability in meteorological observation and improves the accuracy of its forecasts/warnings as well as its ability to disseminate these forecasts/warnings more promptly to effectively mitigate the damages caused by weather-related natural disasters.

To fulfill the above requirements, the Government of Japan is supporting the disaster management sector in Sri Lanka, particularly after the tragic tsunami event of December 2004.
The grant aid project for the “Improvement of Meteorological Information and Disaster Management Network” is one such example of Japanese cooperation in the area of disaster management with the Government of Sri Lanka. Through the project, 38 automatic weather observation systems were deployed to improve weather observation capacity. The location of the automatic weather observation systems deployed are indicated in the map. Under such circumstances indicated above, the Government of Sri Lanka has requested the Government of Japan to implement a project to enhance the capacity of the DOM to accurately predict extreme weather events which can lead to natural disasters. In response to this request, the project for Improving of Meteorological Observation, Weather Forecasting and Dissemination in Democratic Socialist Republic of Sri Lanka started in September 2014.

The overall objective of the Project is to reduce the devastation which may result from natural disasters and effectively mitigate the adverse effects thereof. This could be achieved by improving the DOM’s capabilities in meteorological observation and forecasts/warnings on weather hazards which are extreme manifestations of nature that may lead to immeasurable loss and distress for a large number of people and have also become determining factors for significant setbacks in the national economy.

Sri Lanka has four (4) rain seasons as indicated below. Each season has varying spatiotemporal variations of rainfall. In implementing a meteorological project in Sri Lanka, it is of vital importance to comprehend the characteristics of rainfall in Sri Lanka in detail.

**First Inter-Monsoon Season**

Characteristic:
The state of the atmosphere becomes unstable due to the domination of sea breeze resulting in the development of thunderstorms in the afternoon/evening. Heavier rainfalls (over 300 mm) during the season are confined mainly to the southwestern quadrant of the country.

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**Northeast Monsoon Season**

Characteristic:
Northern and eastern areas receive much rainfall due to the moist northeast wind blowing from the Bay of Bengal or due to tropical disturbances that develop in the Bay of Bengal.

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**Southwest Monsoon Season**

Characteristic:
Southwest monsoon winds bring a great amount of moisture to Sri Lanka. Total rainfall amount for the season in the southwestern mountainous areas is more than 3,000 mm due to the orographic effect while that of the northern and eastern areas over the mountains is very much less.

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**Second Inter-Monsoon Season**

Characteristic:
Rainfall of convective origin dominates during this season. The tropical weather systems that develop in the Bay of Bengal also affect the weather of the country during this period.
Approach undertaken to solve the identified issues

**Step: 1**
Preparation of new manuals and the revision of the existing manuals for measuring meteorological parameters as well as the periodic maintenance and calibration of the meteorological observation equipment.

**Step: 2**
Review of the existing rules of observation recording and reporting (observation time, observation procedure and recording/reporting procedure). Revision of the edition of the existing manuals.

**Step: 3**
Procurement of standard instruments necessary for the calibration of the meteorological observation instruments and of the spare parts necessary for the maintenance of the Automatic Weather observation Systems (AWS).

**Step: 4**
Implementation of the training on the maintenance & calibration of the meteorological observation equipment. Recording of observation data & reporting in accordance with the manuals prepared under the Project.

<table>
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<tr>
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<th>Manuals, Guides and Reports to be prepared</th>
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<td>For Calibration (observation data comparison review)</td>
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<tr>
<td>For Observation</td>
<td>Meteorological Observation Manual</td>
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</table>
Approach undertaken to solve the identified issues

Transition to an alternative communication system

**Step: 1**
Examination of the IP-VPN system operated through ground communications network as an alternative to the existing unstable VSAT satellite communication systems.

**Step: 2**
Implementation of the connection test and communication line stability test of the alternative communication system combined with training.

**Step: 3**
Implementation of technology transfer and indirect support for transition to the alternative communication system.

Replacement of the existing GTS/MSS

**Step: 1**
Preparation of the required technical specifications in order to procure a new GTS Message Switching System compatible with the binary data format (BUFR) as recommended by the WMO (WIS).

**Step: 2**
Procurement, installation, commissioning of the new GTS Message Switching System and implementation of initial operation training.
**Transition from Qualitative Forecast to Quantitative Forecast**

*Approach undertaken to solve the identified issues*

**Step: 1**
Development of a Weather Forecast Guidance by using the Grid Point Values of the Numerical Weather Prediction (NWP) and the Observation Data of the AWSs.

- Weather Forecast Guidance (every 12 hours precipitation up to 36 hours ahead and every 24 hours maximum wind speed)
- Weekly Weather Forecast Guidance for Precipitation (24 hours precipitation for 7 days ahead from the initial time)
- Weather Forecast Guidance of Sea surface Wind (every 24 hours up to 48 hours ahead)

**Step: 2**
Implementation of trainings for the improvement of the existing methods/procedures of seasonal precipitation forecast.

- Detection of the precipitation trend by comparison among monthly accumulated rainfall values, climate values of the DOM and monthly precipitation forecast.
- Detection of the tendency of sea surface temperature by using monthly accumulated rainfall and monthly precipitation value of the NWP.
- Reflection of the sea surface temperature trend in the seasonal forecast.

**Step: 3**
Implementation of trainings aimed at improving the accuracy of weather forecasts by utilizing the weather forecast guidance values, the observation data, the NWP products, etc.
Safeguarding of the people's lives from meteorological disaster

~ Heavy Rain · Strong Wind · Lightning ~

**Approaches for the identification of the solution to the problem**

**STEP : 1**
Review of the current situation on the present advisory/warning criteria and confirmation of their appropriateness through a comparison with the disaster records and the related observation data.
- Collection of the weather charts, disaster records and the related observation data within the past 30 years.
- Analysis of the severe weather phenomena which generated natural disasters using the collected materials.
- Identification of the issues in the advisories/warnings issued and the criteria used according to the specified areas.

**STEP : 2**
Improvement of the advisories/warnings to be issued and of the criteria of heavy rainfall & strong wind through discussions with the concerned agencies and the formulation of new advisories/warnings and criteria of lightning.
- Implementation of trainings on the formulation and preparation of advisories/warnings and criteria
- Improvement of the advisories/warnings and criteria of heavy rainfall & strong wind according to the specified areas.
- Formulation of new advisories/warnings for lightning through the use of the numerical weather prediction products.
- Enhancement and evaluation of the advisories/warnings and criteria through test operation.

Current issuance of advisory/warning universally applied with the same criteria of all over the country.

Operation of the improved advisory/warning and criteria classified according to the specified area.

- **Heavy Rain**
- **Strong Wind**
- **Lightning**
Improvement of the DOM Website

Approach undertaken to solve the Identified Issues

**STEP : 1**
Conversion of the existing DOM Website (static HTML) into Dynamic HTML (Dynamic Hyper Text Markup Language, a technology used to create animated websites).

**STEP : 2**
Improvement of the design of the website for a more comfortable and enjoyable browsing of weather information by the users.
- Improvement of the visualization effects of textual information
- Utilization of easy-to-see figures and tables in the weather information page and weather warning/advisory section
- Improvement of the meteorological education Webpage for children.
- Introduction of compatibility for Web access when using a smartphone.

**STEP : 3**
Enhancement of the Webpage function for user’s free downloading of the Web products.

**STEP : 4**
Implementation of training on updating the Webpage and its products.
Animated Cartoons for natural disaster awareness and Open Class

Approach undertaken to solve the Identified Issues

Production of Animated Cartoons for disaster awareness

Step: 1
Production of animated cartoons (with sound and voice) about the frequent disasters experienced in Sri Lanka and the safety measures that need to be taken to overcome them.

- Title: Save Yourself
- Episodes:
  - The climate of Sri Lanka
  - Lightning and Tornado
  - Heavy rainfall
- Languages:
  - English, Sinhala, Tamil

Step: 2
Implementation of technology transfer on planning the production of disaster-prevention educational materials

Open Class

Step: 3
Implementation of the “Open Class” at schools to show the animated cartoons

- Showing the animated cartoons
- Evaluation of the students’ understanding by conducting a pre/post test
- Commentary and question/answer session
- Provision of rubber mascots of the DOM to all the attendees as certificates of attendance to the open class