**Severe Weather Forecasting Demonstration Project (SWFDP)**

**Regional Sub-project for Bay of Bengal (SWFDP-BoB)**

**Regional Training Workshop on**

**Severe Weather and Impact Forecasting and Warning Services**

(Colombo, Sri Lanka, 3-8 December 2018)

**Provisional Programme for 3-5 December 2018**

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| **Day 1: Monday, 3 December 2018** |
| 09:00-09:30 | **Registration** | All  |
| 09:30-10:00 | **Opening** * Welcome Remarks by local host
* Message by WMO
* Group Photo
 | DG, DOM-Sri LankaAta Hussain (WMO) *All (30 min)* |
| 10:00-10:30 | *Coffee/ Tea Break* |  |
| 10:30-10:50 | **Strengthening capacity of NMHSs in improving forecasts and warnings through SWFDP** | Ata Hussain *(20 min)* |
| 10:50-11:00 | **SWFDP-BoB Training Workshop programme and objectives**  | Ata Hussain *(10 min)* |
| 11:00-12:30 | **What are the major hazards in your country?**Country presentations and Group activity on national forecasting capacity and verification activities at NMHSs (Bhutan, Bangladesh, India, Maldives, Myanmar, Nepal, Pakistan, Sri Lanka and Thailand**Severe weather forecasting – the forecasting process**Group activity (discussion on the participants essays)Important Note: Participants should write a short essay on their current forecasting process and upload your document on shared Google Drive as mentioned below. For writing essay, please think about a severe weather event for which you had to provide a forecast. This is sometime a daunting task!Describe briefly the event. Think about the forecasting process you followed (including use of available products) and describe it. What were the weaknesses/gaps you encountered? Some of the topics you may want to consider are: clarity of task, user interface/communication, forecast confidence/uncertainty and predictability. Please describe a forecasts from the medium range and its updates as you got closer to the event itself.------------------------------------Please upload your document (include your name) by **28th November 2018**.Your replies will be the starting base for a 45-minutes discussion on how to address gaps and weaknesses in the forecasting process. Each participant will have 2 minutes to highlight the key points described in the submitted document. | All trainees M. Mohapatra (to facilitate)(*90 min)* |
| 12:30-13:30 | *Lunch Break* |  |
| 13:30-13:45 | **Current weather discussion**  | DOM-Sri Lanka*(15 min)* |
| 13:45-14:15 | **SWFDP-BoB Website and portal (RSMC New Delhi) (Interactive Demo)** | M. Mohapatra (RSMC New Delhi))*(30 min)* |
| 14:15-15:30 | **Flipped classroom: Ensemble forecasting**Group activityImportant Note: Participants centred class. We will discuss concepts presented in the eLearning module and review the questionnaire:https://www.ecmwf.int/assets/elearning/ensemble/ens1/story\_html5.html Questions (after completing the module):* Why do you think forecasts can go wrong?
* How does ensemble forecasting address (or does not address) the reasons for 'providing wrong forecasts' you have outlined above?
* What is the EDA?
* What constitutes a 'good' ensemble forecast?
* What is the set up of the ECMWF Ensemble forecasting system?

Please upload your answers on shared Google Drive (or send by emails) by the **28th November 2018.** Please make sure to add your name on the document before uploading. | Anna Ghelli All trainees*(75 min)* |
| *15:30-16:00* | *Coffee/ Tea Break* |  |
| 16:00-16:45  | **Game (Probability)**(The participants will be able to make better use of the probability forecasts through understanding its relevance and importance in decision making ) | Anna Ghelli All trainees *(45 min)* |
| 16:45-17:30 | **Verification of forecasts/warnings and verification methods: contingency tables and scores** (The participants will be able to carry out contingency table verification with the help of the tools used in the session, and will understand the meaning of the most useful scores)Important Note: Please following e-learning course on forecast verification by **28th November 2018** prior to the workshop. <https://eumetcal.eu/links/> Please click on "Verification module" to take the course on above website. Participants should complete the introductory module and the module on Categorical forecast verification --- about 2 hours work | M. Mohapatra All trainees*(45min)* |

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| **Day 2: Tuesday, 4 December 2018** |
| 09:00-09:45 | **Extreme Forecast Index (EFI) and Shift of Tails (SOT) index**Important Note: Participants are requested to go through the following e-learning module:<https://www.ecmwf.int/assets/elearning/efi/efi1/story_html5.html>This must be completed by the 28th November 2018.**Challenge No.1 – EFI and SOT in practise**We will be looking at severe weather events using EFI/SOT and related products. | Anna Ghelli All trainees (trainees can be split into 4 teams?)*(45 min)* |
| 09:45-10:30 | **Interpretation of NWP model products for daily forecasting** | M. Mohapatra *(45 min)* |
| 10:30-11:00 | *Coffee/ Tea Break* |  |
| 11:00-11:45 | **RSMC Daily Guidance Products** * Forecast process: product checklist, use of NWP guidance, etc.
* Guidance preparation: graphics and alerting message with examples
* Confidence level: how to quantify with examples

Use and interpretation of short and medium range guidance | M. Mohapatra *(45 min)* |
| 11:45-12:30 | **Challenge No.2 – Forecasting Heavy Rain*** Each team (4 teams) is given with a heavy rain case
* Go through the forecast process for heavy rain
* Assess for any extreme rainfall and their potential impacts

Analyze different scenarios with timing, severity, confidence, alerting/warning strategy | Anna Ghelli All trainees (trainees can be split into 4 teams?)*(45 min)* |
| 12:30-13:30 | *Lunch Break* |  |
| 13:30-13:45 | **Current weather discussion**  | DOM-Sri Lanka *(15 min)* |
| 13:45-14:45 | **Challenge No.2 – Forecast Presentation*** Presentations on heavy rain forecasting by each teams
* Discussion and debriefing by instructor/facilitator(s)

(Grades for all teams will be considered for award for the best team)**Review of challenge No. 2:*** Forecast process for heavy rain: product checklist, conceptual models, rainfall categories, uncertainties, limitations, etc.
* Assessment of extreme rainfall events based on EFI and SOT
* Assessment of consequential impacts, e.g. landslide, flash floods, etc.

Forecast decision: most likely scenario, worst case scenarios, extreme events, confidence levels, alerting/warning strategy | Anna GhelliAll trainees (trainees can be split in to 4 teams?) (*60 min)* *(10 min for each team; 20 min for discussion)* |
| 14:45-15:30 | **Challenge No.3 – Forecasting damaging/extreme winds** * Each team (4 teams) is given with a high wind case
* Go through the forecast process to identify origins and relevant fields
* Assess for any extreme winds and their potential impacts
* Analyze different scenarios with timing, strength, confidence, alerting/warning strategy
 | M. MohapatraAll trainees (trainees can be split in to 4 teams?) *(45 min)* |
| *15:30-16:00* | *Coffee/ Tea Break* |  |
| 16:00-17:20 | **Challenge No.3 – Forecast Presentation and review** * Presentations on damaging winds forecasting by each teams
* Discussion and debriefing by instructor/facilitator(s)
* Forecast process for high winds: product checklist, origins, uncertainties, limitations, etc.
* Assessment of extreme wind events based on EFI and SOT
* Assessment of consequential impacts
* Forecast decision: most likely scenario, alternative/worst case scenarios, extreme events, confidence levels, alerting/warning strategy

(Grades for all teams will be considered for award for the best team) | All trainees(trainees can be split in to 4 teams?)M. Mohapatra & Anna Ghelli (to facilitate)(80 min) (10 min for each team; 20 min for discussion) |
| 17:20-17:30 | **Award for the best forecasting team** | Anna Ghelli & M. Mohapatra (to facilitate) (10 min) |

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| **Day 3: Wednesday, 5 December 2018** |
| 09:00-10:00 | **Nowcasting based on satellite and radar products** * Satellite based information and products, and its use
* Radar based information, products and its use
* Rainfall nowcasting basics (e.g. radar QPE/QPF)
* Performance and limitations

Important Note: Please do the following e-learning courses by **28th November 2018** prior to the workshop.<http://www.wmo.int/pages/prog/amp/pwsp/Nowcasting.htm>Please click on "Proceedings" at the bottom to see detailed introduction of application of Nowcasting techniques.Radar Signatures for Severe Convective Weather (about 1.5 hours): <https://www.meted.ucar.edu/training_module.php?id=193#.Wo_w6YNuaUk> | All traineesM. Mohapatra (to instruct) *(60 min)* |
| 10:00-10:30 | **Atmospheric instability and overview of stability indices/ specific products and their potential use in diagnosis of deep convection** K-Index, Total Totals Index, Lifted Index, Vertical Velocity, CAPE, Precipitable water, Theta-E etc. | Ata Hussain(*30 min)* |
| 10:30-11:00 | *Coffee/ Tea break* |  |
| 11:00-11:30 | **Statistical adaptation of NWP products** | M. Mohapatra *(30 min)* |
| 11:30-12:30 | **Brainstorming on impact based forecasting (value adding process)**  | Ata Hussain *(30 min)* |
| 12:00-12:30 | **Tropical cyclone analysis & forecasting*** TC position fixes and track forecast
* TC genesis and intensity forecast
* Useful NWP/EPS products and tools for TC track/intensity forecast
* Uncertainties and representations
 | M. Mohapatra *(30 min)* |
| 12:30-13:30 | *Lunch Break* |  |
| 13:30-13:45 | **Current weather discussion**  | DOM-Sri Lanka *(15 min)* |
| 13:45-14:30 | **Forecasting tropical cyclone impacts*** High/extreme winds/rainfall
* High/extreme waves/swells
* Flooding due to storm surge

NWP/EPS products and tools | M. Mohapatra *(45 min)* |
| 14:30-15:30 | Verification of forecast * Verifying forecasts and warnings including TC verification
* Interpretation of verification statistics Including practical activities with verification examples from RSMC New Delhi
 | M. MohapatraAll trainees *(60 min)* |
| 15:30-16:00 | *Coffee/ Tea break* |  |
| 16:00-17:00 | * SWFDP date base and reporting by NMHSs
* Survey/Questionnaire on evaluation of this training
 | Ata HussainAll trainees |

**Resource Persons**

1. Dr Anna Ghelli (ECMWF)
2. Dr M. Mohapatra (IMD/RSMC New Delhi)
3. TBD-Department of Meteorology (DOM)-Sri Lanka
4. Mr Ata Hussain (WMO Secretariat)

**Important Note for Trainees on pre-workshop e-learning Courses:**

All the trainees are required to complete a few e-learning courses (as mentioned above within the training programme) before coming to the training workshop. The objective of the e-learning courses is to assist the trainees to have better preparation and to refresh their knowledge prior to the workshop.